MARINE REVIEW.

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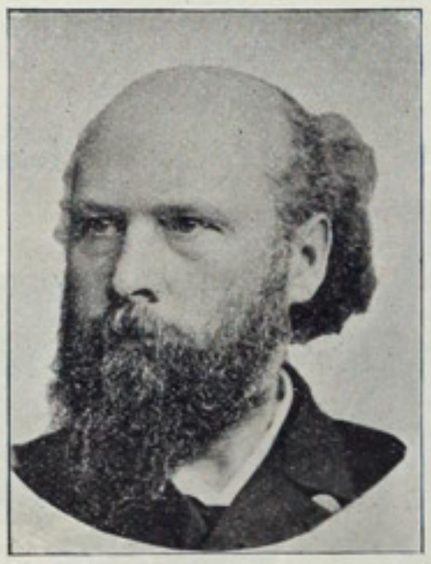
BATTLESHIPS KEARSAGE AND KENTUCKY.

THEY ARE NEARING COMPLETION AT NEWPORT NEWS, VA., AND EMBODY RADICAL CHANGES THAT WILL INTEREST NAVAL EXPERTS IN ALL PARTS OF THE WORLD.—TWO MOST FORMIDABLE FIGHTING VESSELS.

One object of an enlarged edition of the Marine Review at this time was to present a full description of the battleships Kearsarge and Kentucky, now well along towards completion at the works of the Newport News Ship Building & Dry Dock Co., Newport News, Va. With this end in view, a painting of the Kearsarge made from plans furnished by the navy department, was prepared, and a chromotype reproduction of the picture is one of several supplements accompanying this issue. Nowhere in the world are ships building that are more interesting to the naval architect than the Kearsarge and Kentucky. The single feature of double turrets in these two fighters has alone provoked more discussion than any one technical question in naval construction that has arisen in years. In the Newport News ship yard, where these vessels are building, this country has one of the finest private yards in the world, at least as regards modern equipment and thorough organization for a great variety of naval work. In describing the two battleships, an opportunity is also presented to publish numerous views of the ship yard.

CHIEF CONSTRUCTOR HICHBORN.

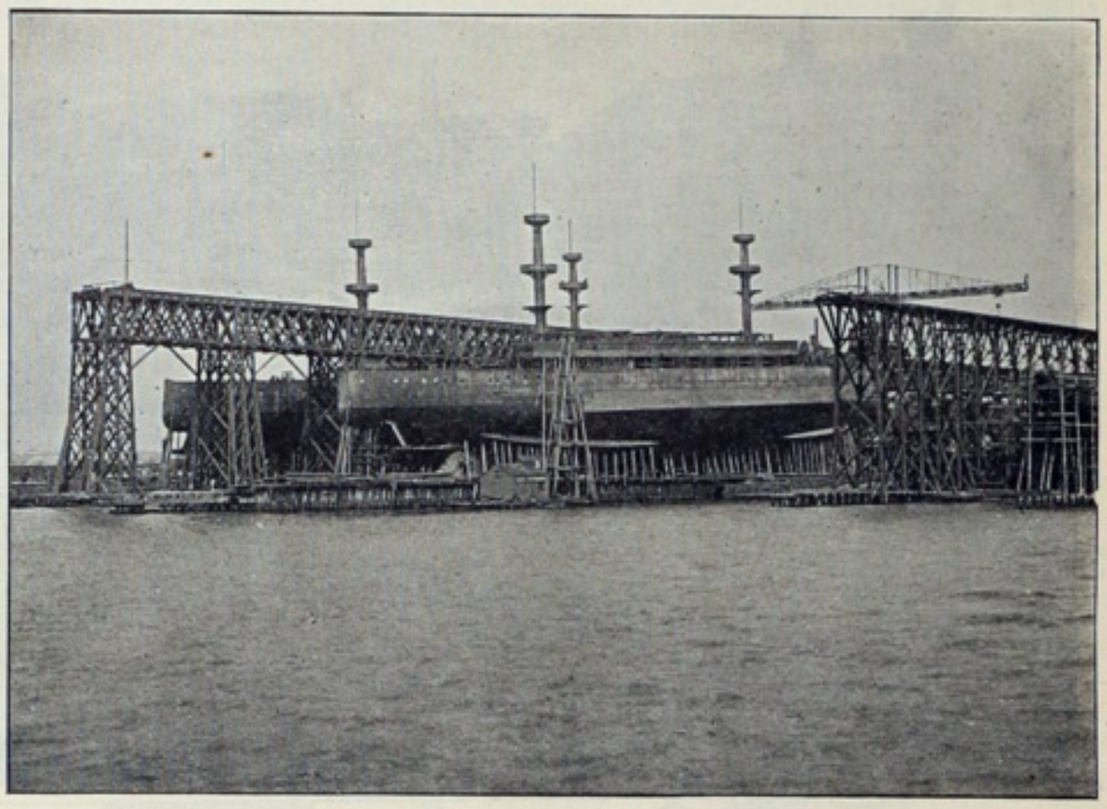
Everyone conversant with naval affairs remembers how when the designs for the battleships Indiana, Oregon and Massachusetts were given out all naval Europe took no pains to conceal its skepticism regarding the plan to flank the 13-inch guns of the main battery with eight 8-inch armor-piercing rifles placed within four heavily armored turrets at an elevation of 26 feet above the water line. The theory was new and radical in its departures from existing practice, and the recognized authorities on the other side of the Atlantic argued many things against the possibility of its practicability, not the least of which was their contention that no battleship could carry so great an armament with any hope of its successful manipulation. All of the points raised against these three vessels have, of course, been disproven over and over again by their performance. Mistakes were made, however. The naval architect who originates is bound to make them, and the officials of the United States navy department realized this to such an extent that they went forward along the lines laid down in plans of these ships with the distinct ambition to discover points of weakness that might be remedied in future construction. To the surprise of the United States officials and the astonishment of their confreres across the water, the gunnery trials and actual service disclosed only one defect. This was an interference of fire between the 13 and 8-inch guns. This discovery that the effect of the discharge of the heavy guns on the vessels extended over a wider area than had been anticipated precluded, of course, the possibility of the 8-inch guns being used to the full extent of their supposed capabilities, which had included a project for firing full ahead or astern and also through a large arc of training on the opposite beam. This latter would of course entail a firing across the top of the turrets occupied by the 13-inch guns, which was found to be impracticable. Indeed it was demonstrated that if the 8-inch guns were laid any nearer the turrets occupied by the larger weapons than 80 degrees forward of the beam, the effect of the discharge would be such as to make it impossible for men to remain in the sighting hoods of the 13-inch guns. These latter guns, in turn, when fired on the maximum train abaft the beam, were found to necessitate the sacrifice of the axial fire of the 8-inch guns. The best that could be done in the way of a remedial measure was to place stops on the turrets of the 8-inch guns in such a manner that they are prevented from training any nearer than 10 degrees to the axis of the ship.



ENGINEER-IN-CHIEF MELVILLE.

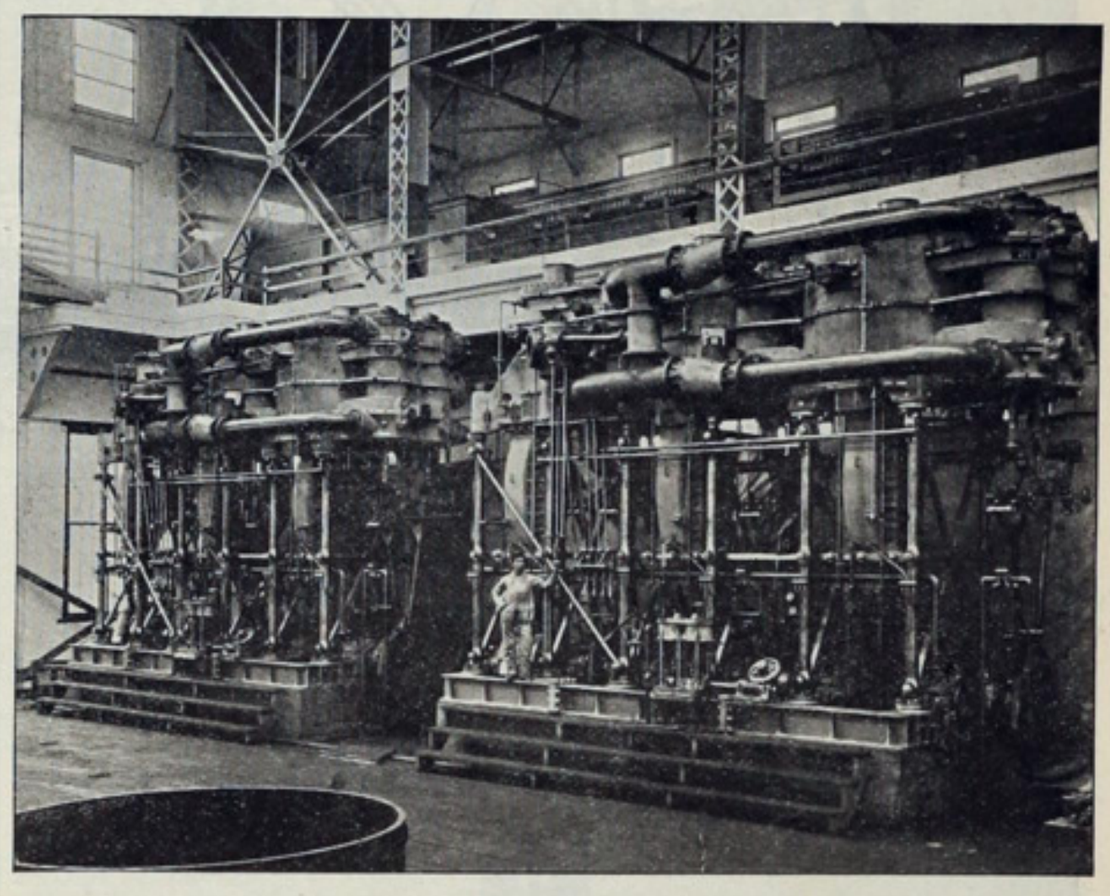
All these circumstances combined to make a very complicated problem. It was one over which the experts in the engineering, construction and ordnance bureaus of the navy department pondered long, and which was considered from every possible standpoint and with an estimate upon the effect of every possible influence. Finally they presented their solution and it was at once striking and novel and daring. Nothing more absolutely original has ever been presented in battleship construction. Possibly the very circumstance of its being an experiment, but an experiment with so much in its favor, induced its adoption. At any rate, the plans were approved with very little delay, and in the face of the astonishment or free predictions of failure from even the most progressive of the European authorities.

The new plans contemplated nothing less than the obliteration of two of the 8-inch turrets and the placing of one of the remaining pair on top of each of the 13-inch turrets. This would, of course, reduce the firing power, but it was argued that by reason of the increase of the arc of training, the four guns would in reality be capable of more efficient service than the eight as arranged on the Indiana, Oregon and Massachusetts. For instance, the maximum concentration of fire from the eight 8-inch guns of one of the older battleships is four on each broadside, with no dead



KEARSAGE AND KENTUCKY ON THE STOCKS.

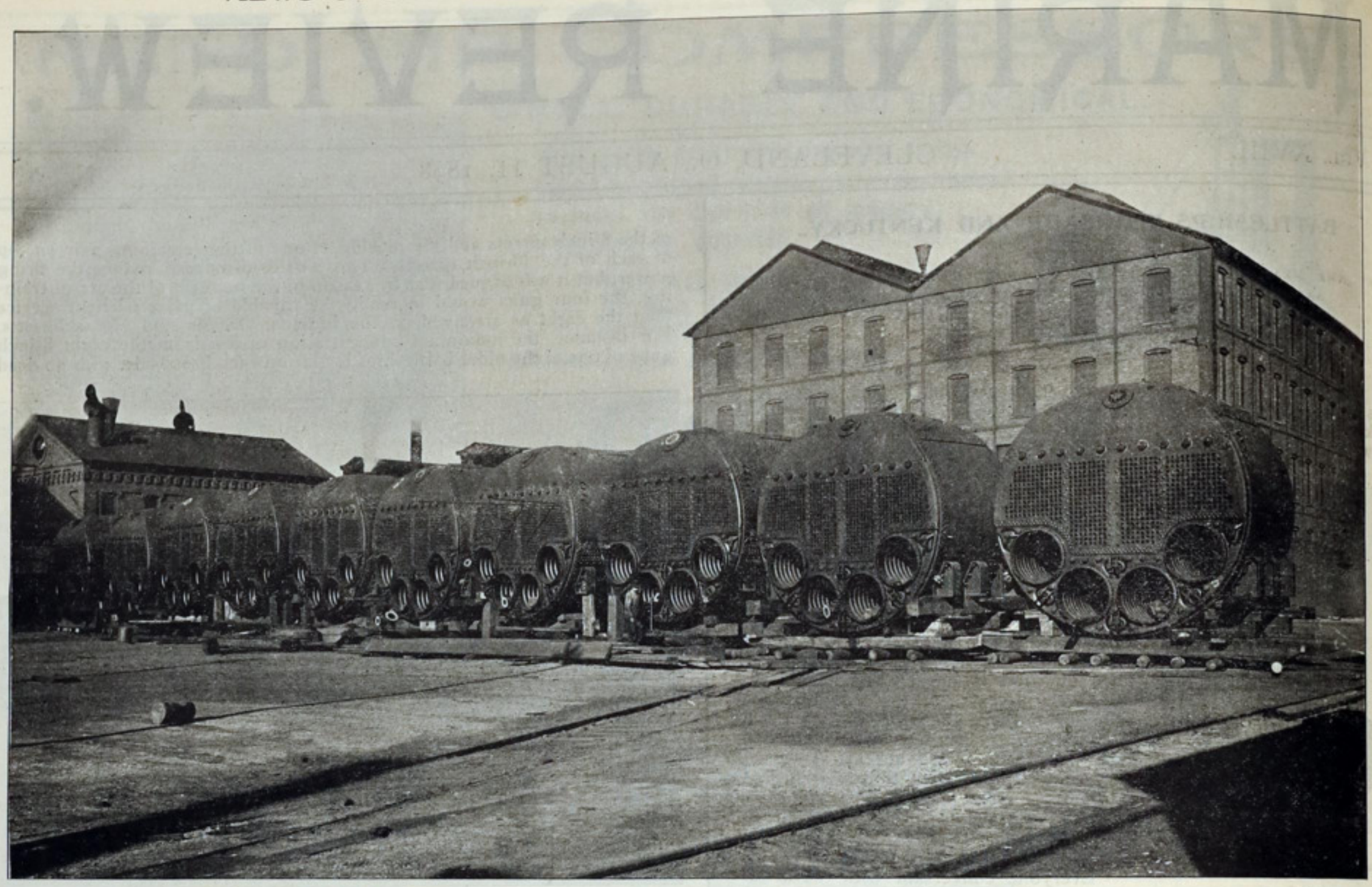
ahead or astern fire, while the new arrangement, as exemplified in the construction of the Kearsarge and Kentucky, permits not only the concentration of four 8-inch guns on either broadside, but allows each pair to swing through an unbroken arc of 270 degrees ahead or astern. Moreover, it was proven by experiment that the discharge of the 8-inch guns would not induce the slightest interference with the operation of the 13-inch turrets. Despite all these claims, however, a storm of discussion and even ridicule assailed these new plans, although it must be admitted that it had but slight effect upon the naval constructors, who had come through an exactly similar prelude in the case of the battleships of the Indiana class and were evidently confident of their ability to a second time emerge



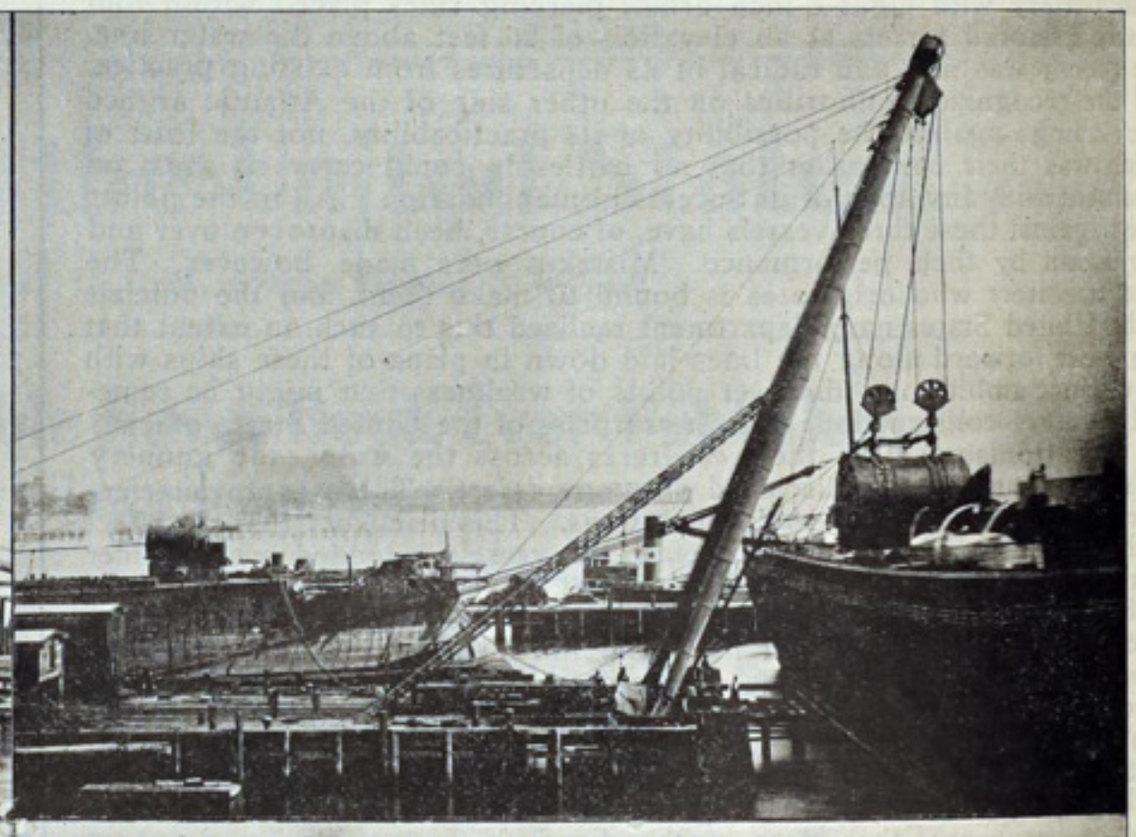
STARBOARD ENGINES OF KEARSAGE AND KENTUCKY.

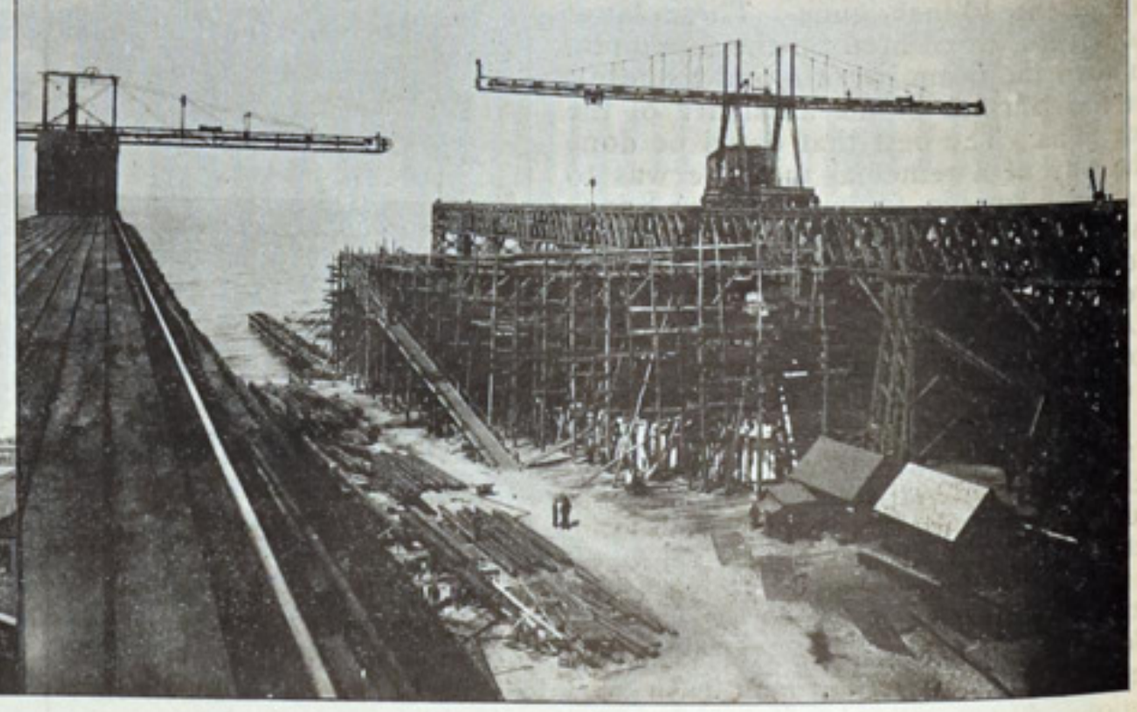
triumphant. One of the principal points advanced by the skeptics with much assurance was that of the risk involved by the double turret. They fell back on the traditional theory that in all war vessel designs the ship's gun stations should have the widest possible separation, in order to minimize the amount of damage possible of infliction by a single shot, landed by an enemy. It was argued that if a shot which struck the upper turret were capable of piercing its 9-inch armor, there would be an almost certainty of the wrecking of the turning gear provided for both turrets, while if a shot of sufficient power of penetration to pierce the 15-inch armor struck the lower turret, the upper turret would in the very nature of things be disabled simultaneously with the wrecking of its foundation. There were also other objections among them the nicety of computation as to

VIEWS OF SHIP BUILDING PLANT AT NEWPORT NEWS, VA.



Boilers of the Battleships Kearsarge and Kentucky.





Hoisting and Conveying Machinery in the Ship Yard.

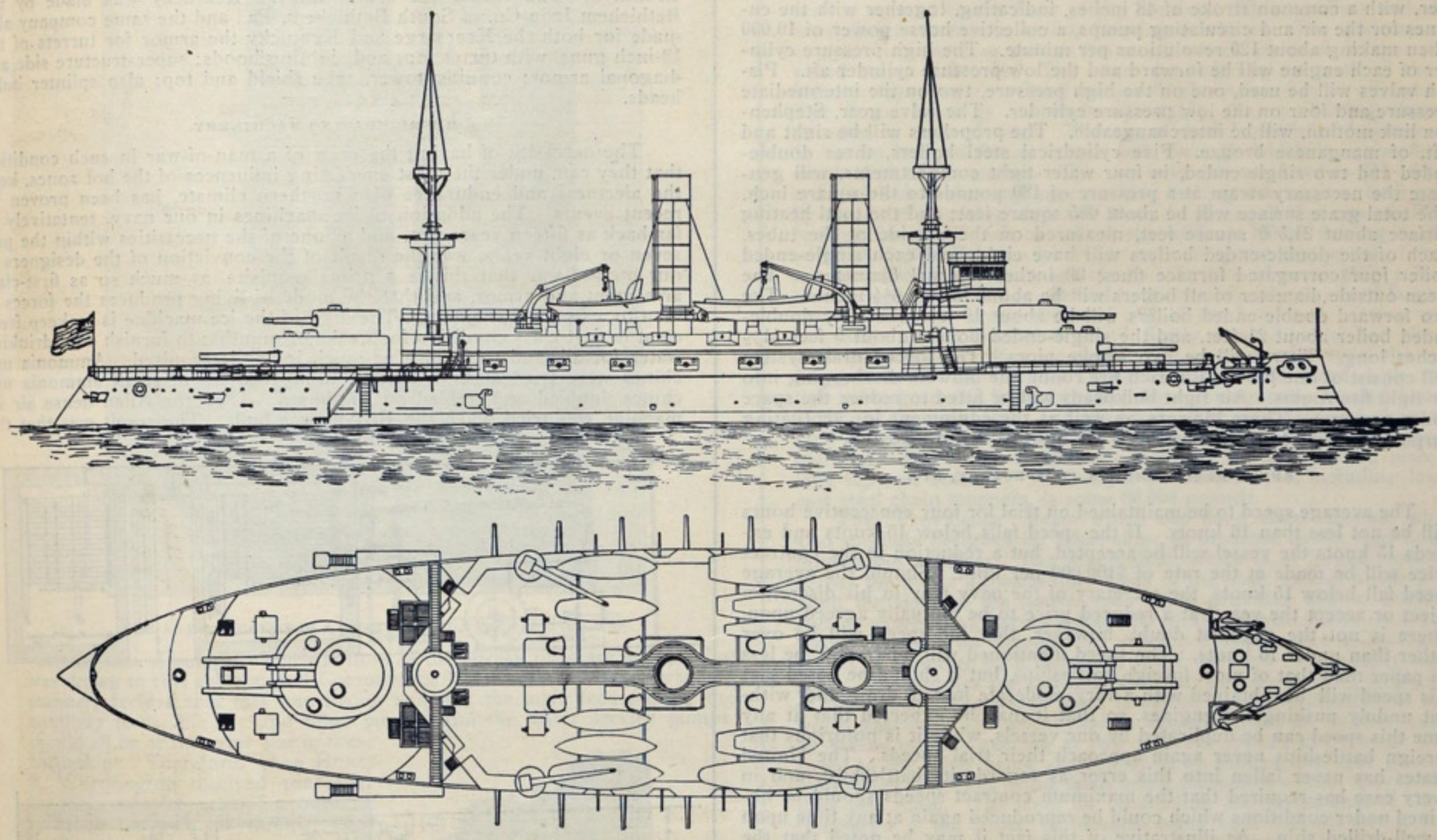
Mammoth Crane Hercules, Capacity 140 Tons.
Brown Traveling Ship Crane for Hoisting Frames and Plates.

100-Ton Shear Legs Hoisting Boiler Aboard La Grande Duchesse.
Scaffolding Around Kearsarge, Showing Brown Traveling Cranes.

FOR DESCRIPTION SEE PAGE 18.

weights and resistance necessary, and the alleged possible inconvenience of having to at all times fire the two sets of guns in a double turret at objects in the same general direction. Many of these arguments the American experts did not answer, although they did give a very satisfactory theoretical disproval of the statements anent the danger to the turning apparatus for the turrets, which the United States officers asserted had, in the 15-inch armor stipulated, the very best protection possible.

In the matter of rapid-fire armament the designers of the Kearsarge and Kentucky, indeed, seem to have builded better than they knew. The result could hardly be more satisfactory had they had the benefit of the lessons afforded by the naval engagement at Santiago—that conclusive demonstration of the supremacy of the rapid-firer. The battleships will have broadside batteries of fourteen 5-inch rapid-fire guns, seven guns on either broadside and ranged on the main deck between the two turrets. Each of these guns will be enabled to fire through an arc of 90 degrees. They throw projectiles weighing 50 pounds, and it has been estimated that one broadside of these guns on the Kearsarge or Kentucky would, during every minute of a fight in which she was within range of an enemy's vessel, be enabled to throw 56 shots, or a total weight of 3,000 pounds of steel, at a velocity of 2,300 feet per second, and with a destructive or force effect of 102,704 foot tons—a weight sufficient to lift a modern battleship 9 feet in the air. The superiority of this combination of 5-inch rapid-firers and 8-inch guns over the greater number of 8-inch and four slow-firing 6-inch guns of the Indiana, Oregon and Massachusetts will be apparent if a moment's thought is given to the subject. Indeed when the whole armament



Outboard and Deck Plans of the Battleships Kearsarge and Kentucky.

of these vessels is considered, there would seem to be ample justification of the claim that they will be the most formidable fighting machines afloat. To demonstrate this but a momentary resumé is necessary. A broadside on either of the battleships would consist of four 13-inch, four 8-inch and seven 5-inch guns, a total of 15 guns, throwing missiles weighing 1,100, 250 and 50 pounds respectively, and with a total energy at every discharge of 179,390 foot tons.

ELECTRICITY FOR TURNING TURRETS.

Another feature of these two battleships, which partakes of the experimental in character, is the use of electricity as power for turret propulsion. The question of turret-turning gear is a problem with which all nations, the United States included, has been grappling for years. The whole matter has not as yet passed the experimental stage. Steam, hydraulic, pneumatic and electrical power have all been utilized for the work, and the advocates of the latter have within the past couple of years been particularly active in the presentation of the claims of their favorite method. The electrical gear has been utilized in the English, French, Russian and German navies for the turning of small turrets, and in some of the more recently constructed vessels of the Russian and French navies for larger turrets as well, and so, except in the matter of a direct comparison, there was nothing original in the installation by the United States of electrical turning gear for two of the 8-inch turrets on the armored cruiser Brooklyn, while steam was retained as the propelling power of the other two turrets. The results seemed to rather favor the electrical installation, but they were to such a degree superficial that the officials determined to make a thorough test. The battleships Kearsarge and Kentucky were selected for this work, and these vessels have been equipped with electrical motors throughout the turrets for the control of all operations. As this means the operation of the heavy mechanism of the 13-inch turrets, superimposed with 8-inch turrets, the test is far and away the most severe that has been made by any government at any time, and will be watched with the most intense interest everywhere, for the reason that it will, if successful, establish conclusively the superiority of the electrical mechanism. There is no denying, however, the fact of this feature being an experiment, and while the department has confidence that the electrical system is capable of greater progress and improvement than any other now in use, the utilization of electricity for turning gear will be confined to these two vessels until they shall have been in commission long enough to permit of the compilation of some definite data. The motors for turret turning gear, boat cranes, etc., as well as the electric light plants, are being furnished by the General Electric Co.

DESCRIPTION AND PARTICULARS OF HULLS.

Principal dimensions and other particulars of the Kearsarge and Kentucky are as follows: Length between perpendiculars, 355 feet; length on load water line, 368 feet; length over all, 371 feet; beam, molded, 72 feet; extreme beam, 72 feet 2½ inches; freeboard, forward, 14 feet 3 inches; freeboard, amidships, 11 feet; freeboard, aft, 12 feet 3 inches; normal mean draught with 410 tons of coal, 23 feet 6 inches; displacement on this draught, 11,500 tons; speed, 16 knots; area of midship section, 1,623 square feet; area of load water plane, 19,833 square feet; wetted surface, 30,000 square feet; tons per inch of immersion, 47.30; movement to alter trim one inch, 948.5 tons; mean draught with 1,210 tons of coal, all stores, etc., 25 feet; displacement at this draught, 12,350 tons; metacentric height at a draught of 25 feet, 4.5 feet; range of stability at 12,350 tons displacement, 57½ degrees; maximum righting arm, 2.08 feet; maximum righting movement, 25,688 foot tons; angle of maximum righting arm, 32 degrees. There will be five torpedo tubes. The height of axis of the forward 13-inch guns above the normal load water line will be 20 feet 8 inches; of the after 13-inch guns, 19 feet; of the forward 8-inch guns, 29 feet 3 inches; and of the after 8-inch guns, 27 feet 8 inches.

NO SACRIFICE OF ARMOR PROTECTION.

It might naturally be supposed that in providing so marvelously efficient an armament for these vessels it would have been found necessary to make some sacrifices in the matter of armor strength, but in reality special attention was given to this point and the department of construction devised a plan whereby the gun positions of these vessels have complete armor protection from a distance of 4 feet below the water line to the top of the 8-inch turrets. This armor, as well as all other armor used on the vessels, will be of solid nickel steel, Harveyized. The lower part of the protection—the barbette, so-called—will have armor 15 inches in thickness. The armor of the 13-inch turrets will also be 15 inches, except immediately in front, where it will be made 17 inches. The armor protecting the 8-inch guns will be 9 inches, but that also will be made 2 inches heavier immediately in front. The battery of fourteen 5-inch rapid-fire guns, mounted on the main deck between the turrets, will be protected by continuous armor 6 inches thick, a splinter bulkhead 2 inches thick being worked between each gun station. Protection of the hull against injury to the water line region will be effected by means of a side armor belt of a maximum thickness of 16½ inches, with a mean depth of 7½ feet, so disposed in reference to the load line that the vessel, with 410 tons of coal on board, will have 3½ feet of this belt armor above the water, and with 1,210 tons of coal on board will have 2 feet above the load line. The belt will extend from the stem to the after barbette, and will maintain the maximum thickness from the after end of the belt to the forward boiler-room bulkhead, whence it will taper gradually to a thickness of 4 inches at the bow. Protection will be afforded above the main side armor by a

steel belt 5 inches thick, extending up to the level of the main deck and running in a fore-and-aft direction from the center of the forward to the center of the after barbette. On top of the main side armor belt will rest a flat steel deck, 2¾ inches in thickness; and forward and abaft the machinery and boiler spaces the deck will be inclined at the sides and the thickness on the slopes increased to 3 and 5 inches. To further protect the vessel against raking fire, athwartship bulkheads of armor 10 and 12 inches thick will be worked at the points where the deck is worked with inclined sides. In addition to the armor belts, cofferdams filled with compressed, fire-proofed, American corn-pith cellulose will be worked the entire length of the vessel in the region of the water line. The conning tower will have armor 10 inches in thickness with a tube 7 inches in thickness leading down to the armor deck for the protection of the voice pipes, telegraphs, steering rods, etc.

Throughout the vessels the use of wood is reduced to a minimum. The stateroom bulkheads will be made of steel covered with cork sheathing, and every attention will be given to lighting, heating, draining and ventilating the vessels in the most approved and efficient manner. All wood materials of every description will be treated by the electric fire-proofing process.

MAIN ENGINES AND BOILERS.

Power for the propulsion of these battleships will be furnished in each case by triple expansion engines actuating twin screws, each screw being propelled by single engine having cylinders of 33½, 51 and 78 inches diameter, with a common stroke of 48 inches, indicating, together with the engines for the air and circulating pumps, a collective horse power of 10,000 when making about 120 revolutions per minute. The high pressure cylinder of each engine will be forward and the low pressure cylinder aft. Piston valves will be used, one on the high pressure, two on the intermediate pressure and four on the low pressure cylinder. The valve gear, Stephenson link motion, will be interchangeable. The propellers will be right and left, of manganese bronze. Five cylindrical steel boilers, three double-ended and two single-ended, in four water-tight compartments, will generate the necessary steam at a pressure of 180 pounds to the square inch. The total grate surface will be about 685 square feet; and the total heating surface about 21,500 square feet, measured on the outside of the tubes. Each of the double-ended boilers will have eight, and each single-ended boiler four corrugated furnace flues, 39 inches internal diameter. The mean outside diameter of all boilers will be about 15 feet 6½ inches. The two forward double-ended boilers will be about 19 feet, the after double-ended boiler about 21 feet, and the single-ended boilers about 9 feet 11½ inches long. There will be two smoke pipes. The forced draft system will consist of one blower for each fire room, the blowers discharging into air-tight fire rooms. Air tight bulkheads will be fitted to reduce the space under pressure. These blowers, as well as the equipment for ventilating purposes, will be furnished by the B. F. Sturtevant Co., Boston.

SPEED REQUIREMENTS, COAL SUPPLY, ETC.

The average speed to be maintained on trial for four consecutive hours will be not less than 16 knots. If the speed falls below 16 knots and exceeds 15 knots the vessel will be accepted, but a reduction in the contract price will be made at the rate of $100,000 per knot. Should the average speed fall below 15 knots, the secretary of the navy may in his discretion reject or accept the vessel at a reduced price to be mutually agreed upon. There is not the slightest doubt. however, that the speed will be over rather than under 16 knots. The speed mentioned will, of course, be less on paper than that of most foreign battleships, but it should be noted that this speed will be obtained with a very moderate forced draft and without unduly pushing the engines, so that it may be expected that at any time this speed can be duplicated by our vessels, while it is notorious that foreign battleships never again approach their trial speeds. The United States has never fallen into this error as regards its battleships, and in every case has required that the maximum contract speeds should be obtained under conditions which could be reproduced again at any time upon a well-drilled ship. As illustrative of this fact it may be noted that the Indiana upon her trial trip, even after she had been in the water for over a year and probably lost a half-knot of speed through the roughness of her bottom, due to the accumulation of marine growth, still made over 15½ knots upon trial, the contract requirement being 15 only. The Indiana and class are then really 16-knot ships, and the Kearsarge and the Kentucky, having at least the same speed, will be able to manœuver in company with the Indiana class very satisfactorily. These vessels will be able to carry their full supply of coal—1,210 tons—with the greatest ease, their bunker space being so ample that this quantity may be carried without trimming or packing. This amount will be ample for the ordinary contingencies of cruising and for service in time of war along our coast, as, at cruising speed of 10 knots, it will be sufficient to enable the vessels to steam over 6,000 miles, and at 13 knots nearly 4,000 miles. In case the services of these battleships were needed at a distance, however, temporary provision could be made by which 400 or 500 tons extra coal could be carried, with corresponding increase in the radius of action.

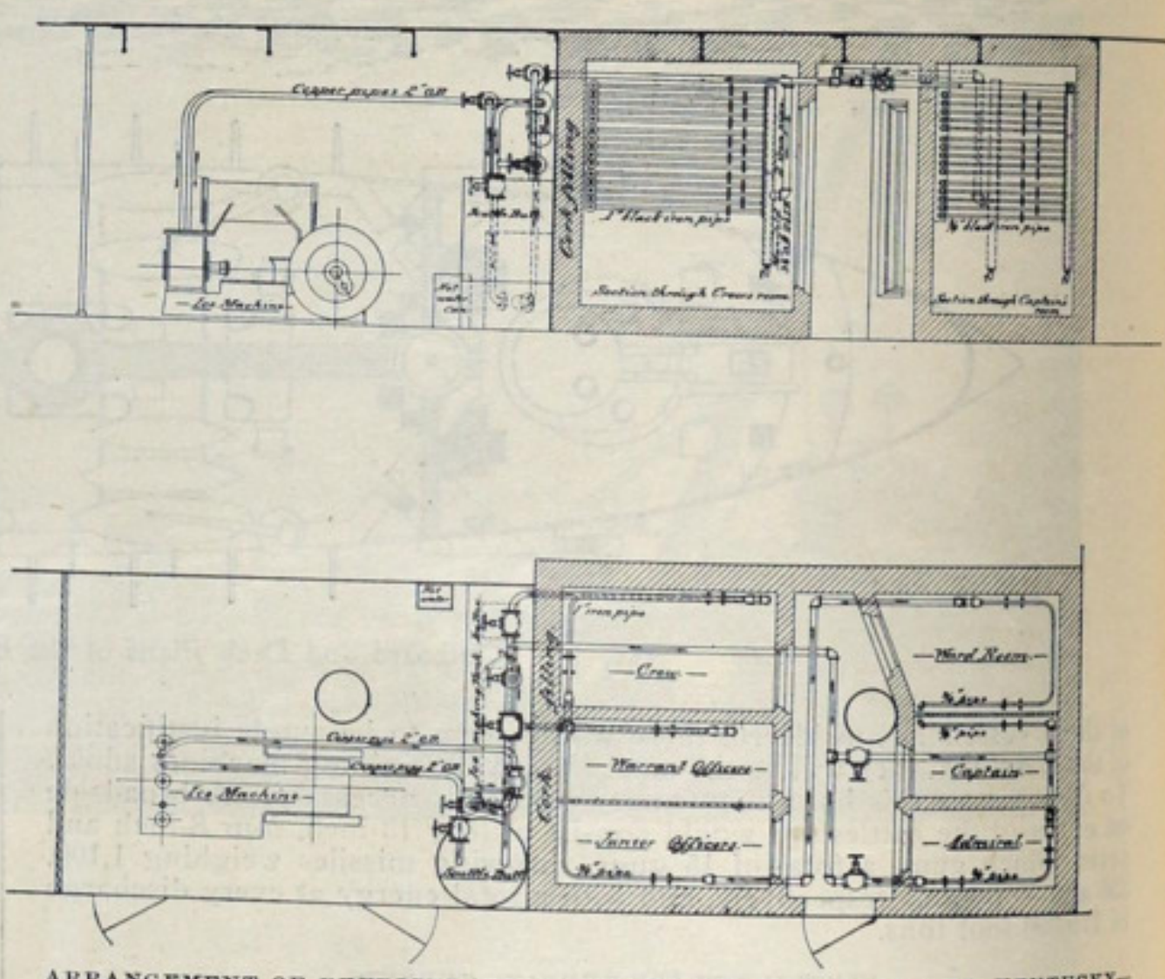
The order from the government for these vessels calls for their completion within three years from the date of the signing of the contract, but by a display of industry and energy, unequaled in the history of the country, the Newport News company was enabled to launch both vessels on March 24 last, not quite twenty months from the time the keels were laid, so that their completion within the next twelve months is confidently expected. The vessels might have been launched two months earlier, but were purposely kept on the stocks until a new crane of great capacity, which is illustrated elsewhere in this edition, could be erected to handle the armor and machinery. In passing, a word should be said relative to the price at which these vessels are being constructed, for there is no better harbinger of the ultimate supremacy of American ship building. The bill, which was passed by congress March 2, 1895, authorizing their construction, placed a limit of $4,000,000 as the cost of each vessel exclusive of armament, and yet when on January 2, 1896, the bids were opened, the contract was awarded to the Newport News company for the remarkably reasonable price of $2,250,000 per vessel, and that, too, without the inducement of an offer of bonus for excess of speed. The Kearsarge and Kentucky will undoubtedly be flagships, in which case their complement will be 520 men—officers, seamen and marines. Needless to say, too, they will be flagships of which any nation on earth might be proud, for it is certain that a careful comparison of these new vessels with any foreign battleships either building or in commission will prove their superiority. They carry heavier guns and more of them, and heavier armor, more widely distributed and protecting more thoroughly the vitals of the ship and the gun crews. Finally they will surprise the wiseacres who have looked askance at the double-turret feature.

RUDDER FRAMES, ARMOR, AUXILIARY MACHINERY.

It is certainly fitting in a description of naval vessels so important to the United States as the Kearsarge and Kentucky to recognize the several concerns throughout the country that furnish auxiliary machinery and other parts of the ships, such as armor, rudder frames, etc. Rudder frames for both vessels were furnished by the Cleveland City Forge & Iron Co. of Cleveland. They were sent by lake and canal to New York and thence by steamer to Newport News. The rudder frames weigh in the neighborhood of 16 tons, and are of the following dimensions: Extreme height, 20 feet 6¾ inches; extreme width, 19 feet 4 inches; extreme thickness of frame, 38 inches; diameter of rudder stock, 18 inches. In the matter of dimensions these frames are almost exact duplicates of those made for the battleships Alabama, Illinois and Wisconsin. The Cleveland company has also at one time or another furnished rudder frames for the New York, Columbia, Minneapolis, Indiana, Massachusetts, Iowa and Brooklyn. The entire side armor for the Kentucky was made by the Bethlehem Iron Co. of South Bethlehem, Pa., and the same company also made for both the Kearsarge and Kentucky the armor for turrets of the 13-inch guns, with turret tops and sighting hoods; superstructure side and diagonal armor; conning tower, tube shield and top; also splinter bulkheads.

REFRIGERATING MACHINERY.

The necessity of having the crew of a man-of-war in such condition that they can, under the most enervating influences of the hot zones, keep the alertness and endurance of a northern climate, has been proven by recent events. The adoption of ice machines in our navy, tentatively as far back as fifteen years ago, and as one of the necessities within the past seven or eight years, was the result of the conviction of the designers of our men-of-war that this is a prime requisite, as much so as first-class armament and armor, and that the mode of living produces the forces of man to a very great extent. The duty of the ice machine is to keep fresh meat in first-class condition for weeks or months; to furnish cool drinking water for all, and to furnish as much ice as is required. Ammonia machines were tried at first, but the usual troubles of small ammonia machines doubled and trebled on shipboard. Then the Allen dense air ice machine was tried when the Boston was built. The result was that this



ARRANGEMENT OF REFRIGERATING APPARATUS, KEARSAGE AND KENTUCKY—PLAN OF SCUTTLEBUTT NOT INCLUDED.

machine alone has been used since that time. It has been demanded in the specifications of all larger men-of-war, and at this time fully twenty-five are in service in the United States navy and several others are building for ships of the United States, as well as for foreign men-of-war. It is the machine that will be used on the Kearsarge and Kentucky.

In this machine only common air is employed as a medium for producing cold, which is done by compressing the same in an air compressor, cooling it with water while under pressure, and then expanding it in an engine. The expansion of air produces as much cold in air as compression heats it. The principle of the Allen dense air ice machine is that air of usually 60 pounds pressure, maintained in pipes, is compressed, cooled and expanded back to 60 pounds, and is thus brought to 40 to 60 degrees below zero while confined in pipes. It is then led to the refrigerated places, which take the cold from it, and is then returned to the machine and is refrigerated over again while continually confined. This makes the ice machine as handy as an auxiliary steam engine. The cold air is led in small pipes to considerable distances, and through hot places to wherever it is handy to place the ice making box, the meat rooms and the scuttle butt. The accompanying plan shows the arrangement of refrigerating apparatus on these two battleships. The plan of scuttle butt is not included.

EQUIPMENT OF PUMPING MACHINERY.

Previous to the selection of pumping machinery for the Kearsarge and Kentucky it had been the practice of marine engineers and designers (particularly for the navy) to use pumps of a great variety of sizes, necessitating the carrying of a large number of spare parts to accommodate the various sizes of pumps. The attention of the bureau of steam engineering was drawn to this subject, and Commodore Melville, in his usual practical manner, decided that this was wrong and that the main feed pumps, the auxiliary feeds, the fire and bilge pumps, and the water service pumps should all be of the same size in these battleships. Therefore, when Henry R. Worthington received the order for their complete pumping outfit, it included ten vertical pumps, each having two 10-inch steam cylinders, two 7-inch water cylinders, and all of 12 inches stroke. These were of the Worthington admiralty pattern, as shown in Figure 1. These pumps were designed for a working pressure of 180 pounds per square inch, and were tested to a hydrostatic pressure of 400 pounds per square inch. It will be noticed from the illustration that the piston rods are connected by means of a clamp coupling. This permits the water pistons to be removed without disturbing the valve motion or steam pistons. The water valve chambers are arranged immediately in front of the pump, so that the valves are most accessible, a feature very essential in marine work, where ready accessibility is of extreme importance. These pumps were constructed with all-composition water ends, and each weighs approximately 3,000 pounds.

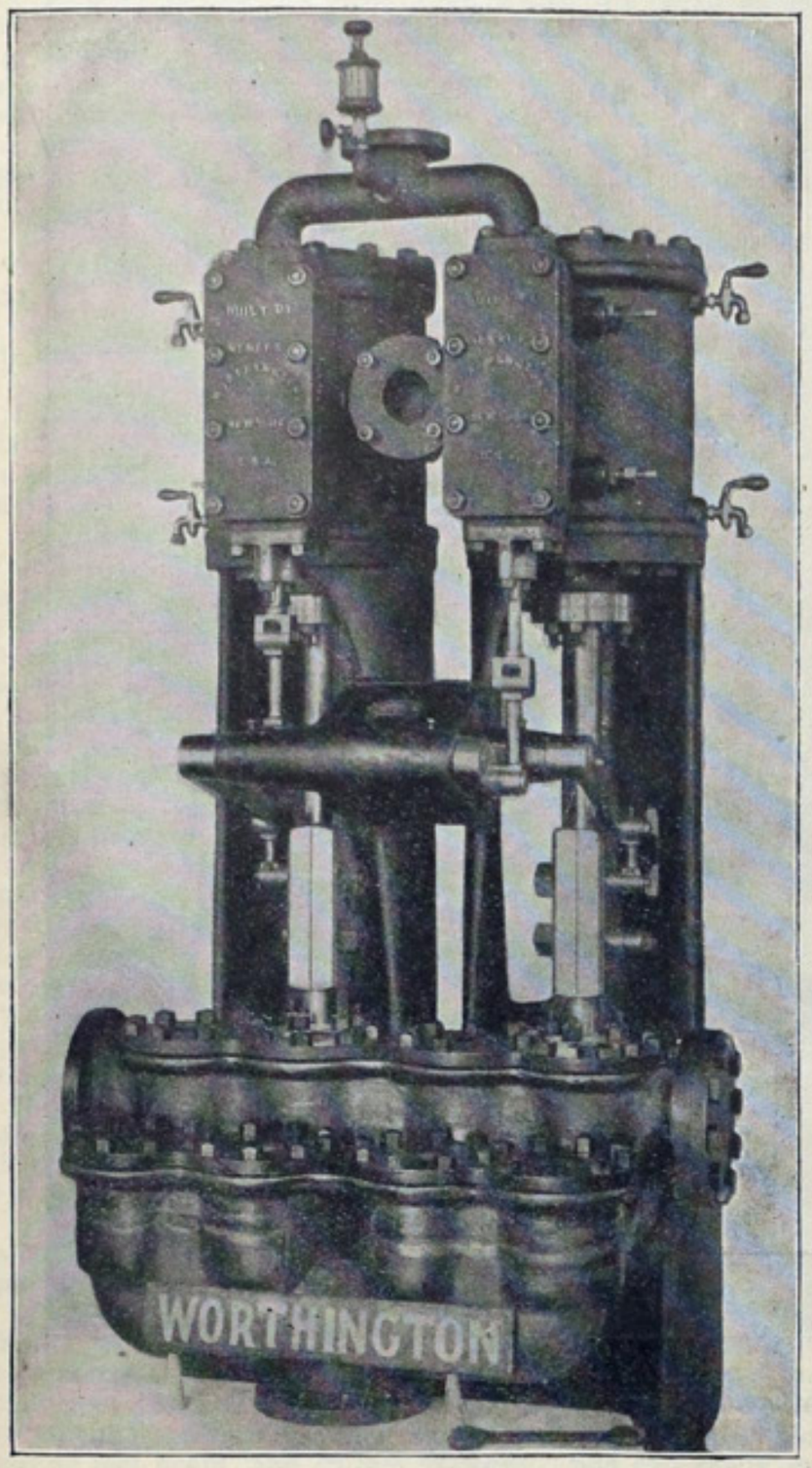


FIG. 1—WORTHINGTON ADMIRALTY PUMP, 10x7x12 INCHES.

The type of air pump used is illustrated in Figure 2, and is of the vertical twin cylinder beam type, the size of the steam cylinders being 12 inches, the air buckets 25 inches, and both of 18 inches stroke. The valve mechanism of this air pump favorably attracted the attention of the bureau of steam engineering because of its great simplicity and positiveness of action. The main steam valve is of the piston type,

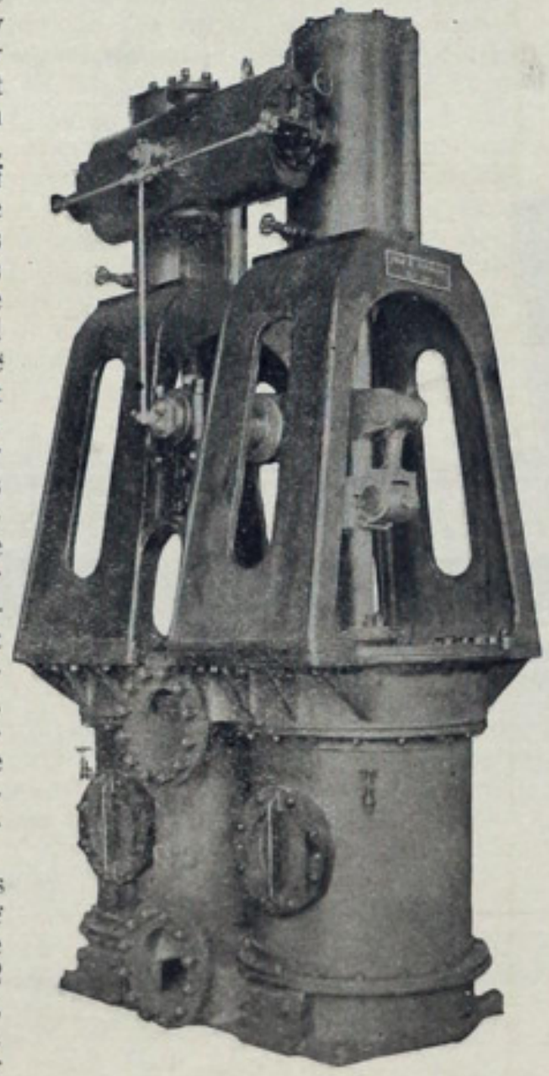


FIG. 2—WORTHINGTON VERTICAL BEAM AIR PUMP, 12x25x18 INCHES.

and is actuated by the admission of steam through the small semi-rotative valves at either end of the steam chest, these being positively operated by a connection from the beam shaft. This arrangement does away with the use of the numerous links, levers, bell cranks and slide valves, and therefore, not being subjected to the wear and friction of all these parts, its action is positively assured. The air ends of the pumps are of the usual single-acting bucket type, and are made entirely of composition metal. It will be noticed that the steam and water cylinders are held rigidly together by cast-iron frames. These maintain the alignment of the pumps without regard to supports from the structure of the ship outside of the bolting to the foundation. These battleships are also equipped with Worthington condensers and air and circulating pumps for the auxiliary machinery, and there are also numerous other pumps used for evaporating and distilling plants, for feeding oil to the bearings and for various other minor services.

WINDLASSES, CAPSTANS, WINCHES.

These machines are all of types made by the American Ship Windlass Co. of Providence, R. I. In arranging for the "Providence" windlass for these two battleships it was found by the designers of the ships that in order to provide for the maximum depression of the 13-inch guns forward, the windlass and also the auxiliary steam winch must be located partly below the gun deck; that is, a steel house about 12 by 14 feet square is built into the deck, the same extending 4 feet below the deck and about 4½ feet above it at the after side, decreasing in height to 3 feet at the forward side of the house. The windlass rests on suitable thick work, which in turn is secured to the floor of the housing. This windlass embodies the latest improvements in anchor hoisting machines. The wild cats and the co-operating parts, as well as the worm wheel, are made of cast steel, the worm being of bronze. The worm gearing has cut teeth of the Albro-Hindley type, the screw itself being entirely enclosed in an oil-tight casing. The thrust bearings are made adjustable, thus permitting them to be adjusted in case of wear. The worm shaft is made of hammered steel. It has an integral flange at one end, through which it is coupled to the crank shaft of the engine. The two wild cats are fitted to 2½-inch standard stud-link chains and have positive locking mechanism, each operating by means of a locking ring and lever, so arranged that one motion of the locking lever will lock or unlock the wild cat to the driving head of the windlass shaft. Friction bands for controlling the paying out of the chains are of sufficient strength to ride by. In lieu of employing a lever, the tension upon the band is effected by a conveniently arranged large wheel-nut, fitted to the screw-threaded end of the band and bearing against a substantial thrust bracket or stand, firmly secured to the bed plate. The engines of this windlass are double and of the marine type, the cylinders being 15 inches diameter by 14 inches stroke, and fitted with reversing link valve-gear, the latter operated by a conveniently located hand wheel in lieu of the usual lever and quadrant. The cylinders and chest are covered with lagging, the intervening spaces being filled with non-conducting material. The entire windlass is mounted on an iron bed plate planed true top and bottom. The weight of the machine, including four naval cast steel chain stoppers, is some 30,000 pounds.

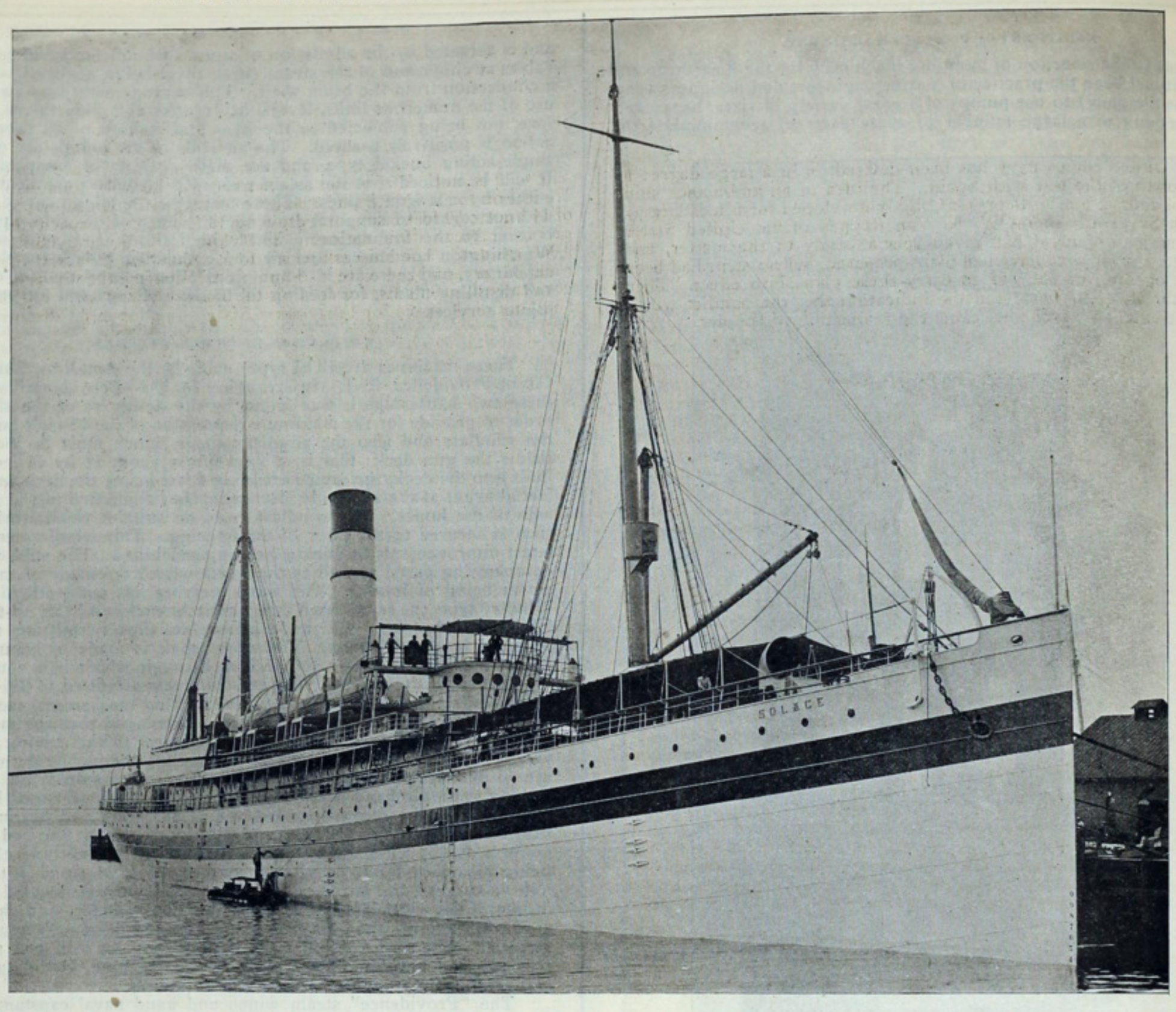
The "Providence" steam winch and hand naval capstan, which was also specially designed for these ships, is mounted in the steel house containing the windlass. The winch shaft, which is of forged steel, extends across the house athwartship. Ends of the shaft extend about 2 feet beyond the sides of the house, each being provided with a double-barrel end, or winch head, having a diameter of 33 inches and 13½ inches respectively. Engines for driving the winch are double, the cylinders being 8 inches in diameter by 8 inches stroke, controlled by reversing link valve gear. The engines are arranged vertically and are secured to the side wall of the house. The winch shaft is driven by a comibnation of spur and worm gearing. The worm shaft is actuated from the engine crank shaft by means of spur gearing at two different speeds, the change from one speed to the other being accomplished by shifting the spur gears on the worm shaft; the ends of the teeth being sharpened so that they will readily slide into mesh. The lever for controlling the movements of the engine is exterior of the house, its location being such that the winch drums or barrels are in full view of the operator at all times. Weight of the winch complete is about 8,000 pounds. The capstan is double geared. By turning it in one direction it is used as a power capstan, and in the opposite direction for speed. The pawls in the head are furnished with a swinging lever for lifting them when it is desired to reverse the direction of the barrel. The barrel is supported on chilled iron balls working on chilled surfaces, thus minimizing the work of friction. The capstan bar holes are provided with a novel device, a ring stopper, for protecting them from the weather, the arrangement being such that all the bar holes can be covered or uncovered at once by one motion of the stopper and automatically locked in either position as desired. The capstan is made of steel and weighs about 3,200 pounds. The shaft is 5 15-16 inches in diameter; diameter of the barrel in the middle, 18 inches. All the parts are readily accessible for oiling, inspection, etc.

STEERING ENGINES, VALVES, ANCHORS, ETC.

Steam steering engines furnished for both ships are of the well-known type made by Williamson Bros. of Philadelphia. This firm also supplied automatic ash-hoisting engines for fire rooms. Foster pressure regulator valves of the navy standard, made by the Foster Engineering Co. of Newark, N. J., are used on the Kearsarge and Kentucky, as on nearly all of the new ships of the navy. Other firms represented in the equipment include the following: Air compressor for charging and firing torpedoes, by Rand Drill Co. of New York; navy type fluke anchors, 13,500 pounds, American Steel Casting Co., Thurlow, Pa.; gate valves for fire main, etc., Chapman Valve Mnfg. Co., Boston; Katzenstein metallic packing for piston rods, valve stem stuffing boxes of main engines, steam pipe slip joints, etc.

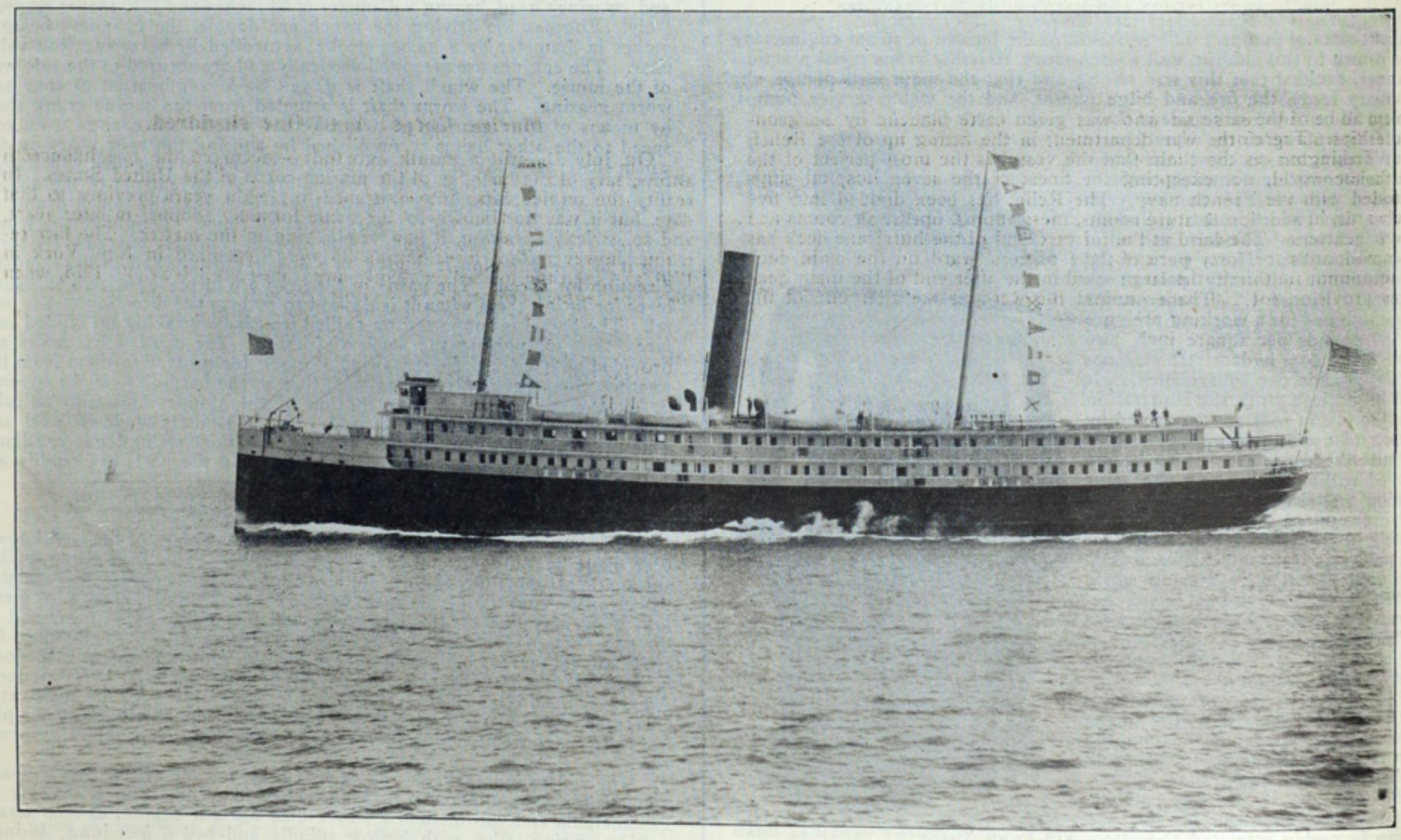
The workshop machinery on each of these vessels will be by no means a small item of equipment. It is furnished by Williamson & Cassidy of Philadelphia and will include a 7 by 7-inch upright engine; 24-inch screw cutting engine lathe, with hollow spindle and bed 8 feet long; 16-inch crank shaper, column type; 18-inch power drill press; combined hand punch and shears, and double wet emery grinder with twelve wheels.

UNITED STATES AMBULANCE SHIPS SOLACE AND RELIEF.



Naval Ambulance Ship Solace, Purchased From Cromwell Steamship Co.

FOR DESCRIPTION SEE PAGE 17.



Ambulance Ship Relief in Army Service—Formerly Maine Steamship Co.'s John Englis.

FOR DESCRIPTION SEE PAGE 17.

OUR AMBULANCE SHIPS.

THEIR HURRIED DEVELOPMENT IN THIS COUNTRY BROUGHT ON BY EXIGENCIES OF THE WAR.—FLOATING HOSPITALS WITH THE BEST OF MODERN EQUIPMENT.

The hospital or ambulance ship, than which no more valuable adjunct to the United States navy has been devised, is in a large degree a direct outgrowth of the war with Spain. The idea of an ambulance ship is not new, of course, but in its present highly developed form it is largely original with Surgeon-General W. K. Van Reypen of the United States navy. The surgeon-general had given special study to the matter, and had even gotten so far as to have had plans prepared, but no steps had been taken at the opening of the war to carry these plans into effect. Then with the outbreak of the war, and the indication that the conflict would be to a great extent a naval one, came the realization of the necessity of such vessels, and here Mr. Van Reypen's thorough knowledge of the subject stood him in good stead, and to it must be attributed largely the success which followed the initial effort to equip a hospital ship on short notice. The exigencies of time prevented, of course, the consummation of many of the surgeon-general's cherished plans, but his study of the subject enabled him to satisfactorily work out the idea with the material at hand in an incredibly short time.

The preliminary steps looking to the equipment of the first ambulance ship were indeed taken a few days before war was formally declared. The steamship Creole of the Cromwell line was purchased by the navy department, renamed the Solace and fitted out at Newport News as a hospital ship, in so far as possible along the lines outlined in the plans by Mr. Van Reypen above mentioned.

The Solace is 375 feet long over all, and 352 feet on the water line; 44 feet beam, and 32 feet 6 inches deep to the upper deck; displacement, 3,600 tons; speed, 14 knots. She has been fitted out very completely with all the appliances of a modern hospital ship, and with no armament whatever. She has two wards on the main deck, the forward one containing 104 berths, and the after one thirty-three berths. There is a large operating room on the upper deck connected with the wards by an elevator. There is also a complete laundry plant, a refrigerating room and an ice machine. Accommodation is provided for a large medical staff and a corps of nurses. Comfortable quarters are also provided for convalescent officers and seamen. The operating room measures 30 by 30 feet and is well lighted and equipped with the latest pattern of aseptic hospital furniture. The floor has been paved with tiling. There is also a disinfecting room equipped with three formaldehyd generators. There are separate rooms for the wounded officers, while the men are berthed in the spacious wards forward and aft. Attached to the ship are four medical officers, three apothecaries, eight graduated nurses, laundrymen, cooks, etc. The vessel, which is painted white with a green stripe, of course flies the flag of the Red Cross.

In this connection something should be said of the army hospital ship Relief—a picture of which, as well as of the Solace, is herewith presented—by reason of the fact that in the readjustment of the navy following the war, the Relief will undoubtedly be assigned to that department. The Relief was formerly the John Englis of the Maine Steamship Line, built within a couple of years at the Roach ship yard, Chester, Pa., and sold to the government for $450,000. She is a steel steamer of 3,500 tons; 328 feet over all; 40 feet beam, and 16 feet draught. She can easily maintain a speed of 12 knots, and under forced draft is capable of 16 knots. The work of refitting the vessel—it embodied the almost complete transformation of the entire interior—was done under the supervision of Naval Constructor Francis T. Bowles and Acting Assistant Naval Constructor William E. Winant. They embodied, however, some of the suggestions of Major George H .Torney, who has been a student of the hospital ship problem for many years and who was given carte blanche by Surgeon-General Sternberg of the war department in the fitting up of the Relief. Major Torney makes the claim that the vessel is the most perfect of the kind in the world, not excepting the finest of the seven hospital ships connected with the French navy. The Relief has been divided into five large wards, in addition to store rooms, mess rooms, operating rooms and officers' quarters. The ward at the forward end of the hurricane deck has accommodations for forty patients; the officers' ward on the main deck will accommodate thirty; the large ward in the after end of the main deck makes provision for 100 patients, and the ward at the after end of the berth deck can take as many more. The total berthing capacity for sick and wounded is about 360. The walls of the wards are painted white, the floors covered with rubber tiling, and the beds of iron enameled white. The surgical ward is in the after end of the main deck and the operating room adjoins it on the starboard side. Bath rooms are connected with all the wards, with the private quarters of the medical staff and with those of the ship's officers. A special shower bath for sick officers showers hot or cold, fresh or salt water, separately or in any combination desired. All the bath rooms are floored with rubber. The electric plant, in addition to supplying light, furnishes the motive power for hundreds of electric fans. Other features of the equipment of the vessel are two complete X-ray outfits in the surgical ward, a microscopic laboratory, and facilities for photographic work, including a dark room. The naval constructors who had charge of the transformation of the steamer devised a special apparatus for hoisting and lowering the sick and wounded. On the forward side of the mainmast a steam boom has been fitted, which can be trained toward any war vessel and so deposit patients on any deck or in any ward desired. The same boom is used to hoist and lower the steam launches. The members of the medical staff have quarters on the main deck, forward. The vessel carries a crew under contract and not connected with either the army or the navy. There has been no little rivalry between the Solace and Relief, but each would seem to have some valuable features which the other does not possess. Both vessels have been used largely for conveying wounded men from Cuba to the hospitals on the Atlantic coast, so that their service so far has been largely that of ambulance rather than hospital ships.

Mention was made above of the study given to the subject of ambulance ships by Mr. Willaim K. Van Reypen, surgeon-general of the navy, and special interest naturally attaches to the outline of his ideas of the requirements of a vessel of this class with which he has favored the Review. Just previous to the opening of hostilities with Spain the surgeon-general found occasion to enter into this question quite fully in a special report, which was accompanied by plans of an ambulance ship. Referring particularly in this report to the plans, he says: "I submit my idea of an ambulance ship arranged to include as many conveniences as is practicable in such a vessel. It is primarily a vessel adapted for the care and welfare of sick and wounded men, and all other considerations are made subservient to this end. The vessel as designed will be 3,550 tons displacement; 275 feet on the load line, and 300 feet over all; with twin screws and a speed of 14 knots; 50 feet beam, and drawing 18 feet; a coal capacity of 450 tons, giving eighteen days' steaming at 10 knots. The water tanks will hold 9,000 gallons. The ship will carry four steam launches and four barges, each barge arranged with a flying floor between the thwarts, so as to conveniently carry twelve cots on the floor. There will be beds for 274, and hammock space for thirty-six. Staterooms for eight disabled officers and cot space for twelve. The beds for the men are hair mattresses on woven wire springs, supported by a plain iron frame-work with corner stanchions. The height of the deck beams being 8 feet, allows two tiers of berths. The forward ward on the upper deck has been left with only one tier of berths, for a ward of isolation, or to accommodate more serious cases. The vessel can comfortably accommodate 330 sick or wounded men, with sufficient berthing space for the crew of the vessel. There are quarters for four medical officers, two apothecaries and twelve nurses. On the upper deck is an inclosed room, 22 by 24 feet, for convalescent officers, and a room 26 by 35 for convalescent men. On this deck also are the galley, laundry, wash room, drying room, lamp room, closets and bath rooms for both officers and men, the office of the senior medical officer and of the executive officer. Dumb-waiters go from the galley to the diet kitchens on the decks below. The upper part of the operating room is also inclosed on this deck.

"Near the center of the ship, on the berth deck, is the operating room, 18 by 21 feet. It is well lighted by a large skylight and by air ports above the upper deck. On either side of this operating room is an elevator, large enough to hold a cot. The elevator runs from the upper to the lower deck and is run by electricity. A patient can be hoisted in his cot from the barge alongside the ship, placed in the elevator, lowered to the operating room, and from there transferred either to a bed on the berth deck or lowered and transferred on the deck below. This transfer is accomplished by means of an overhead trolley, which runs from the operating room and the elevator, between the rows of beds, and by means of which the occupant of any bed can be transferred. On the engine-room deck is an ice machine and cold storage rooms, a disinfecting chamber, Sturtevant blowers, and ample store rooms for all departments of the ship. The ventilation is accomplished by two powerful blowers, with their necessary connections, and supplementary electric fans. The vessel is to be heated by steam and lighted by electricity. The constructor has so arranged the model of the hull as to insure the minimum of motion, either in a head or beam sea. There are steam winches on the upper deck for hoisting or lowering wounded or boats. They can be worked on both sides simultaneously. The outfit of the operating room will include two or three operating tables. These tables are of antiseptic value; are light and portable, being easily folded and carried to any part of the ship. The floor of the operating room will be tiled, and all of its appointments arranged with a view to strict antisepsis. As soon as the action is over, a launch should tow its barge alongside a vessel that has been in action, the wounded should be hoisted out and into the barge by means of the apparatus already described. It should then steam with all dispatch to the ambulance ship, unload its human freight, and speed away again on its mission of humanity. In no other way could wounded men be better cared for, or a fighting vessel be more speedily disencumbered and placed again in readiness for battle."

Marine Corps, Aged One Hundred.

On July 11—just a month ago today—occurred the one hundredth anniversary of the birthday of the marine corps of the United States. In reality the service came into existence fifty-eight years previous to that date, but it was not known by the name formally adopted in later years, and so, strictly speaking, it has no standing in the matter. The fact remains, however, that three regiments were organized in New York in 1740, and then the matter seemingly languished until Nov. 10, 1775, when the Continental Congress, after having resolved that the compact between the crown and the people of Massachusetts bay was dissolved, provided for the raising of two battalions of marines. It was not until April 30, 1798, however, that a regular navy department was established, and on July 11 of the same year an act was approved for the establishment and organization of the marine corps. It was to consist of several officers and 720 privates. The first major commandant was William W. Burrows. The corps consists today of 4,720 men, of which Col. Charles Heywood is the colonel commandant, with five officers of the general staff, one colonel, two lieutenant-colonels, four majors, twenty captains, thirty first-lieutenants, nine second-lieutenants, and twenty-four additional second-lieutenants added during the continuance of the war. The positions held by marine corps men are among those selected for readjustment at an early date, when in all probability higher ranks will be accorded the commanding officers, resulting in a general move up all along the line.

Honors to the Oregon.

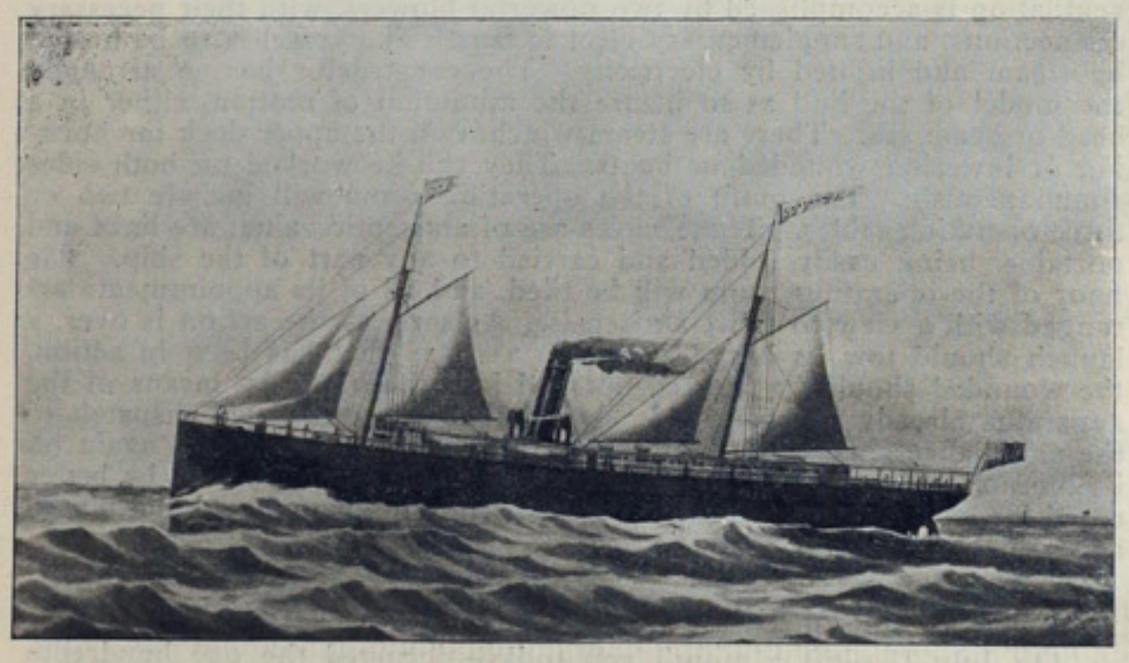
Secretary Long of the navy some time ago sent a letter to the Union Iron Works of San Francisco, commending the firm on the splendid record made by the battleship Oregon, which they built, on her trip around the Horn. The secretary has just received an acknowledgement from the officers of the company, in which they say: "American-designed and American-built, she has offered a new lesson to older nations regarding the functions of a battleship, and we are proud in the fact that under the most trying circumstances it has been demonstrated to your satisfaction and approval that our contract has been well and conscientiously performed. But with all this, we believe that much of the success of all vessels is based on their intelligent handling by their skilled officers, subordinates and men, without which their usefulness would be greatly impaired if not wholly destroyed."

REPAIR SHIP VULCAN.

A NEW UNITED STATES VESSEL UNIQUE IN THE NAVIES OF THE WORLD AND WITH NUMEROUS ADVANTAGES.—FLOATING MACHINE SHOP WITH SPARE PARTS OF ENGINES.

To Commodore George H. Melville, chief of the bureau of steam engineering, belongs the credit of the inception of the idea of the repair ship Vulcan, a vessel that has already proven a most valuable adjunct to the United States navy. If the idea of a vessel devoted to the purposes to which the Vulcan has proven herself so admirably suited ever occurred to anybody else, they certainly did not advocate its acceptance with the degree of persistence followed by Chief Melville, and consequently we are in possession of a type of ship entirely dissimilar to anything else afloat. Commodore Melville, like other promulgators of strikingly original ideas, had no easy task in inducing the official powers to accept his view of the practicability and value of the scheme for an engineers' repair ship. Some time before the outbreak of the war, the engineer-in-chief recommended to the department that two vessels suitable for transformation into repair ships be acquired, and when properly fitted up, attached to the North Atlantic and flying squadrons. There were more official obstacles to be overcome than might be expected, and indeed it is doubtful if Commodore Melville would have his ship as yet, had it not been that the prospect of impending war aroused the department officials to a willingness to try anything that might contribute to the success of our fleets. The engineer-in-chief was called in special conference on the subject, but even after that he was obliged to be content with one vessel instead of two.

The steamship Chatham, which was recommended for purchase by the board of auxiliary cruisers and was later procured, was formerly the property of the Merchants' & Miners' Transportation Co. of Baltimore, and is 285 feet in length by 40 feet beam and 25 feet 4 inches depth. She is schooner-rigged and of 2,729 gross or 1,900 net tons. The vessel was built in 1884 by the American Ship Building Co. of Philadelphia. She is an iron vessel with five water-tight compartments and has a compound engine with cylinders 40 and 72 inches by 48-inch stroke. Her transformation into a repair ship was accomplished at the Boston navy yard. The Vulcan is known officially as an engineers' repair ship, but Commodore Melville in defining her position in the navy, one day, called her a floating machine shop, and the appellation has stuck to the craft ever since. Probably there is not in the entire country a machine shop that is better



THE REPAIR SHIP VULCAN.

equipped than the Vulcan, that is for the variety of tools and with consideration for the latest improvements. Indeed it is stated that her equipment of something over 100 tons of tools and machinery entailed an outlay exceeding $300,000. The interior of the vessel resembles in appearance that of an ordinary machine shop. Included among the machinery for work of the heavier class are plate-bending rolls and punching and shearing machines, capable of satisfactory work on steel of an inch thickness; lathes capable of turning castings of almost any size; good sized planers, drills and milling machines and blowers both for supplying the forges and for purposes of ventilation. The master machinists on the Vulcan assert that their machinery is heavy enough to turn out rapid-fire guns should occasion require. There is a complete equipment of pipe cutters, forges and grindstones, and in fact nothing is lacking for any repairs which might be needed on either hulls, engines, boilers or guns. The bow of the vessel is devoted to a capacious stock room, and back of this in succession are the blacksmith shop, foundry and machine shop. The cupola in the foundry is quite large and capable of melting sufficient metal to make almost any sized casting desired. All the workshops, which are located for the most part on the third deck, are excellently illuminated by a supplemental electric plant, and two steam cranes with 10-foot arms lead to the hoisting drums amidship, and from the cranes to the hatches enable the transfer of machinery from a disabled war vessel to the Vulcan or vice versa with the least possible delay.

The value of the Vulcan was proven conclusively from the very day that she joined Admiral Sampson's fleet. Before she had been there a week, half a dozen war vessels had been in the hands of her mechanics for one cause or another. Not only would they have been obliged in every instance to make a long trip to the mainland had she not been at hand, but it is doubtful if even then the work would have been as satisfactory, for it may easily be imagined that the vessel's equipment is superior to that to be found in shops at small ports, and indeed it is claimed by her officers to be surpassed only by the larger navy yards. The force on the Vulcan successfully repaired the damage to the cruiser Newark, caused by her collision with the Dolphin, and also turned out two shafts for 6-inch gunmounts. The outlined plan is for the Vulcan, in the event of an engagement, to seek shelter in the wake of one of the battleships, while the program when the fleet is cruising is to have the repair ship following in the wake. Her coal capacity is such as to give her a good-sized steaming radius, a quality of no little value in consideration of her duty of supplying fresh water to the vessels upon which she is in attendance. For this work the Vulcan is provided with evaporators and distillers having a capacity of over 10,000 gallons per day.

It has been stated, and there is no reason to doubt it, that no vessel in the navy has in its complement anything like so great a number of men of exceptional skill and standing in their respective professions as the Vulcan. Of the 200 men on board, ninety-two wear the insignia of an officer, a circumstance explainable by the fact that the chief machinists, expert boiler makers, molders, brass finishers, electricians, coppersmiths, carpenters, joiners, shipwrights and plumbers all have the rating of first-class petty officers, as well as the regular complement of officers such as are in command of any vessel. Nor did the bureau of engineering experience the slightest difficulty in manning the vessel with officers and men of exceptional ability. The captain of the Vulcan is Lieutenant Commander Ira Harris, who has been associated as general manager with several of the most prominent firms in Chicago, Cleveland, Buffalo and Kansas City. The chief engineers are Gardiner Sims, the head of the Farmington & Sims Engine Works of Providence, R. I., who has the assistance of thirty picked mechanics from his plant, and Prof. Aldrich of the University of West Virginia, known as one of the ablest electrical experts in the country. The assistant engineer is Frederick C. Neilson, son of Medical Inspector John L. Neilson, United States senior medical officer at Charlestown, and other officers on the staff are: Lieut. I. T. Madge, executive officer; chief engineer, J. H. Chasmar; passed-assistant engineers, J. Alvah Scott, John L. Gow and William S. Aldrich; ensigns, Gerald L. Holsinger and James M. Bower; surgeon, E. M. Blackwell; paymaster, Robert H. Woods, and paymaster's clerk, John R. Woods.

In all probability the Vulcan will have another opportunity to prove her usefulness by her assistance in the wrecking operations on the wrecked Spanish cruisers. Of the record of the repair ship in the present war there need be no fear; indeed she has already more than justified all the claims that were made in advance regarding her usefulness, and there is every reason to believe that this vessel will be made a permanent adjunct of our navy, if indeed it does not become one of several of similar type. There is a disposition, moreover, to have the Vulcan provided with a little better armament than the two 6-pounder rapid-fire guns which she now carries. The vessel is not intended for fighting purposes, of course, but its character will necessitate its presence with the fleet in every engagement, and the effective work done by the Gloucester at Santiago has taught naval officials that it is nothing amiss to have vessels of the auxiliary fleet equipped for offensive as well as defensive work should opportunity offer.

Ship Building Plant at Newport News.

The plant of the Newport News Ship Building & Dry Dock Co. at Newport News, Va., where the Kearsarge and Kentucky are now under construction, is one of the largest and best-equipped, not only in this country, but in the world. This ship yard has been arranged with the idea of avoiding any unnecessary handling of material. Among tools in various parts of the plant are hammers varying from 600 to 6,000 pounds; a screw cutting lathe with 126-inch swing; mammoth cylinder boring machine, capable of boring 18 to 108 inches in diameter; a planer with a capacity for planing vertically 222 inches by 23 feet horizontally; a 24-inch slotting machine; riveters with a pressure of 150 tons and immense hydraulic flangers, rolls and traveling cranes. The yard, which occupies 200 acres of land and has a frontage of one mile on the James river, represents an outlay of $8,000,000 for machinery and equipment. The office building, where are also provided quarters for the engineering staff and government officials, is a three-story brick building 40 by 200 feet in size. The machine shop, in which the firm takes an especial pride, is 100 by 500 feet, with a gallery extending throughout the entire length on either side. It is in this department that much of the most expensive machinery is to be found, including the largest wall planer in the world and a 26-foot crank shaft lathe. The boiler shop is a brick and iron structure 100 by 300 feet, and is equipped with 15 and 40-ton traveling cranes and an electric crane of 100 tons capacity. Adjoining the boiler shop is the blacksmith shop, a building of exactly the same size. The fitting up shop, which is also of brick and iron, is 60 by 320 feet, and the second floor constitutes the largest mold loft in the United States. Among the machinery on the lower floor is the largest set of bending rolls in the world. They are 32 feet in length and have a dead pressure of 850 tons from the top roll. The lumber yard has a capacity of 40,000,000 feet, and adjoining it is a saw mill capable of sawing 80,000 feet a day, together with a joiner and wood-working building of brick, two stories in height and 60 by 300 feet in size.

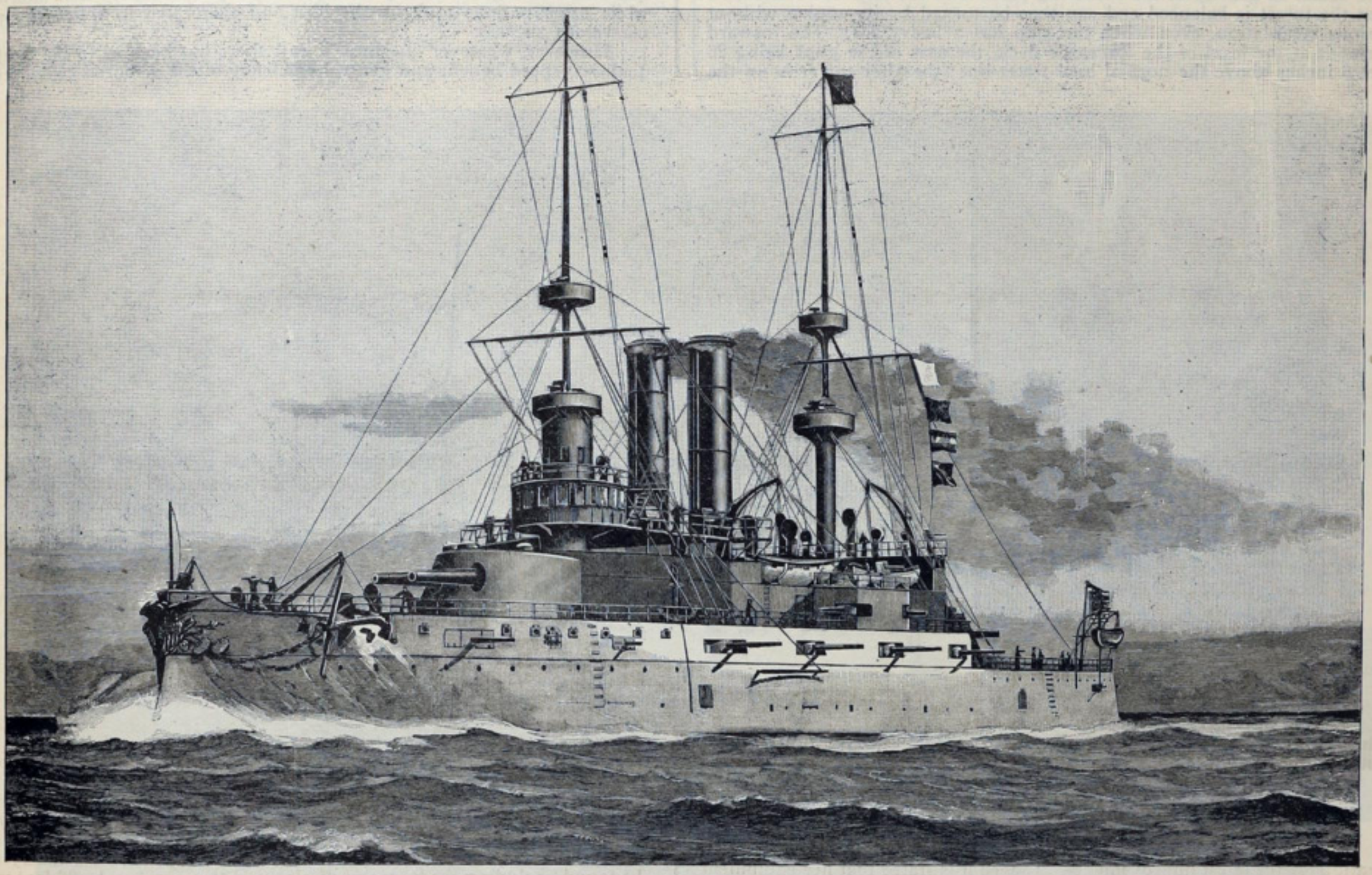
The giant electric cantilever crane, the largest in the world, has an arm 110 feet above the water, and will sweep the space occupied by two vessels 675 feet long by 73 feet beam. Another cantilever crane has a sweep greater than the space required for two 500-foot vessels. There is also a ship carpenter shop 300 feet in length and a good-sized power house. Recently there was completed the erection of the crane Hercules, shown in our supplement, and which has a capacity of 140 tons 75 feet from center, or 75 tons 103 feet 6 inches from center, swinging over a diameter of 207 feet, or 150 feet with 140 tons. Three of the largest of the cantilever cranes in use at the yard were furnished by the Brown Hoisting & Conveying Machine Co. of Cleveland. They are all similar in size and type. With cranes of this kind commanding slips, tool sheds, etc., there is no need of the customary ginpoles, tackles, winches, and gangs of workmen and laborers for handling materials. One of these cranes, with one man to run it, serves two ships with ease. By actual measurement the crane requires, when running at full speed, 595 feet per minute, with full load at end of cantilever, a power of 300 amperes.

The Newport News yard is already equipped with a dry dock 600 feet in length by 130 feet in width, and plans have been prepared for another $1,000,000 dry dock, which is to be the largest in the world and upon which construction will begin shortly.

ALABAMA CLASS BATTLESHIPS.

THREE UP-TO-DATE FIGHTING VESSELS WELL ALONG TOWARD COMPLETION FOR THE UNITED STATES NAVY.—THE ALABAMA, ILLINOIS AND WISCONSIN.

Within a short time there will be added to the vessels of the United States navy in commission, three first-class battleships, modern in every sense of the word, and in strength of battery, armor protection and manœuvering power pretty nearly a match for anything afloat. The Alabama, from which, seemingly by common acceptance, the class takes its name, was launched on May 18 at the yards of the William Cramp & Sons' Ship & Engine Building Co. at Philadelphia. The sister vessels, the Illinois, building at the yard of the Newport News Ship Building & Dry Dock Co., and the Wisconsin, in course of construction at the Union Iron Works, San Francisco, will, if present arrangements are carried out, be launched some time in September of this year. These new vessels will not be speedy, indeed the complaint on this score from some sources has been almost the only fault found with them, and is in a great measure responsible for the lively discussion of the speed question, which has been in progress even more universally than usual since the authorization by congress last May of three new battleships. The Alabama class of vessels, however, are claimed to have many good points of a value to offset the lack of speed, one of the advantages referred to being the comparatively light draught, which will enable the vessels to enter many harbors and rivers.



Battleship Alabama, Building at Cramp's, Philadelphia—Illinois and Wisconsin are Sister Ships.

Dimensions and other details of the vessels of the Alabama class are as follows. Length on load water-line, 368 feet; length over all, 373 feet 9 inches; breadth, molded, 72 feet; breadth, extreme, 72 feet 2½ inches; freeboard forward, 20 feet; freeboard aft, 13 feet 3 inches; freeboard amidships, 19 feet 10 inches; mean draught with 800 tons coal, 2-3 stores and 2-3 ammunition, 23 feet 6 inches; corresponding displacement, 11,520 tons; speed per hour, in knots, 16; indicated horse power, 10,000; area of midship section, 1,613 square feet; area of load water plane, 19,900 square feet; tons per inch of immersion, 47.38; moment to alter trim, one inch, 923.65; wetted surface, 35,300 square feet; rudder area, 225 square feet; maximum helm angle, starboard, 35 degrees; maximum helm angle, port, 35 degrees; mean draught with all stores, provisions, and ammunition and 1,200 tons of coal on board, 24 feet 7 inches; corresponding displacement, 12,140 tons; metacentric height at 24 feet 7 inches draught, 4 feet 6 inches; range of stability at same, 65 degrees; maximum righting arm, 2 feet 6 inches; maximum righting moment, 30,350 foot-tons; angle of maximum righting arm, 35 degrees.

The main propelling engines are of the vertical, inverted cylinder, direct-acting, triple expansion type and are placed in two water-tight compartments separated by a middle-line bulkhead. Particulars are: Collective I. H. P. of propelling, air-pump and circulating-pump engines, 10,000; number of revolutions for this I. H. P., 120; diameter of high-pressure cylinder, 33½ inches; diameter of intermediate cylinder, 51 inches; diameter of low-pressure cylinder, 78 inches; length of stroke, 48 inches; cooling surface of main condensers, 7,000 square feet; cooling surface of auxiliary condenser, 800 square feet. There are eight single-ended steel boilers of the horizontal-return fire-tube type, placed in four water-tight compartments. Particulars of boilers are: Length, 9 feet 11¼ inches; diameter, 15 feet 6½ inches; working pressure (lbs. per square inch), 180; total heating surface of all boilers, 21,200 square feet; total grate surface, 685 square feet; number of furnace flues. 4; diameter of flues, 39 inches.

The hull is protected against injury at the water-line region by heavy tapered armor of a maximum thickness of 16½ inches, and extending from 3 feet 6 inches above to 4 feet below the normal load water-line. The maximum thickness is maintained for the entire length of the engine and boiler spaces. From the forward athwartship coal-bunker bulkhead the thickness is gradually reduced until it reaches 4 inches, which thickness is maintained to the bow. At the top of the belt, for the length of engine and boiler spaces, a flat protective deck 2¾ inches in thickness, worked in three layers, extends from side to side of the vessel, being tap-riveted to the upper edge of the side armor. Forward of the machinery space, however, the protective deck is turned down or inclined to the armor shelf level. Thus, any projectile passing through the vertical armor would, even if it were not broken up or deflected in its passage, have to encounter a sloping deck 3 inches in thickness. Abaft the heavy armor belt, the protective deck is worked in a similar manner to that described for the forward end of the ship, except that the slope plating is increased to 4 inches in thickness in order to afford greater protection to the steering gear. Where the protective deck is inclined at the sides, as above described, coffer-dams 3 feet in width and extending to the top of armor belt are provided, and packed with corn-pith cellulose, compressed to a density of 6 pounds per cubic foot. To provide as far as possible against the serious damage to boilers and engines, due to a raking fire from forward or aft, the opening between the flat deck and the sloping sides is, at each end of the machinery space, closed by diagonal armor bulkheads 12 inches in thickness.

From the top of the thick belt, extending to the main deck, the hull is further protected by a belt of light armor 5½ inches in thickness; this armor extends from barbette to barbette, ending in diagonal bulkheads in line with the 12-inch bulkheads below. Within the limits of this belt the broadside torpedo tubes are placed. Inboard of this 5½ inch armor, and extending well forward and aft, are worked coffer-dams 3 feet in width and 3 feet high, the top of the coffer-dams being 6½ feet above the load water-line. These coffer-dams are also filled with corn-pith cellulose. The side of ship between main and upper decks, and from forward barbette to a point just forward of the after turret, is protected by 5½-inch armor, with diagonal armor terminations, the forward one being worked immediately over the diagonal bulkhead of the deck beneath. Within this light redoubt are placed eight of the 6-inch rapid-fire guns. Thus, the central portion of the vessel is completely enclosed by a continuous wall of armor extending from 4 feet below the load water-line to the level of the upper deck, a distance of about 23 feet, and the walls of this redoubt are in no place less than 5½ inches in thickness. In addition to this very complete protection of the greater part of the 6-inch rapid-fire gun battery against the entry of smaller projectiles, the gun's crews are still further protected by 1½-inch splinter bulkheads worked between each pair of

6-inch guns, thus minimizing the effect of exploding shells, even though they should enter the armored redoubt. The other 6-inch gun positions, on the gun deck forward and on the upper deck amidships, are protected by armor 6 inches in thickness, that on the upper deck being turned in at the ends so as to afford protection against raking fire. The conning tower is protected by armor 10 inches in thickness, being connected with a central station below the protective deck by a tube, the walls of which are 7 inches thick. In addition to the conning tower forward, these vessels are provided with an armored signal tower at the after end of the superstructure deck, the walls of this tower being 6 inches in thickness.

In the character and arrangement of the battery of the Alabama class, decided changes have been made from the designs of former ships of this type. The 8-inch battery has been entirely abandoned, and the calibers of the heavier guns reduced to two, namely, 13-inch and 6-inch. The main battery will consist of four 13-inch guns, mounted in pairs in turrets forward and aft on the midship line, and protected by armor 15 inches in thickness, with port plates 17 inches thick. The ammunition hoists and revolving gear of turrets are protected by barbettes 15 inches thick, except over the arc within the diagonal armor, where the barbette is reduced to a thickness of 10 inches to save weight. The turrets are oval in shape, with the front plates slightly inclined and the rear plates vertical, in order to give ample room for the handling of the guns and their loading appliances. The center of gravity of the revolving parts is in the axis of rotation, so that the turret is balanced and can thus be turned by its engine without serious retardation, even when the ship has a heavy list. The forward turret is at the level of the forecastle deck, the axis of the guns being 26 feet 6 inches above the normal load water-line; the after turret is on the main deck, the axis of the guns being 19 feet above the normal load water-line. Each pair of guns sweeps an arc of 135 degrees from the midship line. Three sighting hoods are provided for each turret, the one in the middle being for the turret turner, whose sole duty is to keep the guns pointed at the target, as far as their lateral direction is concerned. The hoods on each side are for the gun pointers. Between these 13-inch gun emplacements and within the armored casemate previously described, are eight 6-inch rapid-fire guns in broadside. These guns are capable of a total arc of train of 90 degrees, and are protected by 3-inch shields supported on the carriage, and the 5½-inch armor of the casemate. Each gun is separated from its neighbor by 1½-inch steel splinter bulkheads. Four more 6-inch rapid-fire guns—two on each side—are mounted on the upper deck, above this casemate; they are protected by 6 inches of armor, and are capable of firing fore and aft. On the gun deck forward is another pair of 6-inch guns protected by an armor plate 6 inches thick. The auxiliary battery consists of seventeen 6-pounders and six 1-pounder guns, mounted where practicable to obtain good command and yet be clear of the blast from, and interference with, the rest of the battery. Four broadside torpedo tubes, protected by 5½ inches of armor, complete the armament. The weight of fire of one discharge (neglecting the auxiliary battery) from all the guns available on vessels of the Alabama class will be 2,400 pounds ahead and astern and 5,100 pounds bow to quarter.

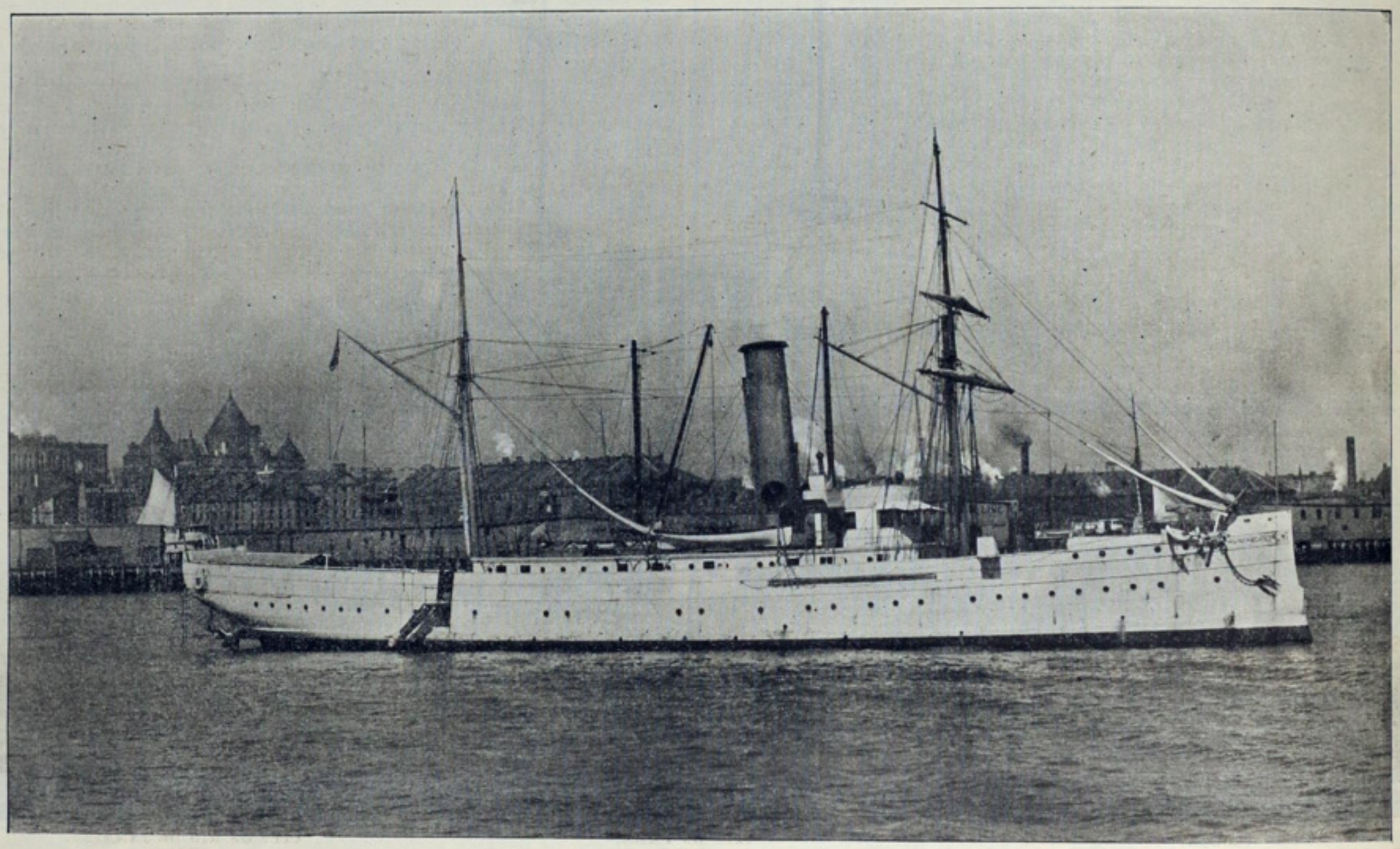
Engineer officers of the German navy have recently been experimenting with Chinese coal, and are said to be eminently satisfied with the results.

SHIPS OF THE ARMORED CRUISER TYPE.

UNITED STATES MAY AGAIN LOOK WITH FAVOR UPON A CLASS OF NAVAL VESSELS WHICH SHE ORIGINATED.—THE FAVORITES, BROOKLYN AND NEW YORK.

Naval officers almost without exception, and that portion of the public generally who are able to take an intelligent interest in the naval affairs of the country because reasonably well informed regarding them, will hail with delight the announcement coming from a semi-official but seemingly authentic source that Secretary Long is preparing a naval program to be submitted at the next session of congress providing for the construction of three battleships and three armored cruisers. It is the latter provision, of course, which is especially welcome. The naval officer—the American naval officer at least—is almost invariably the staunch friend of the armored cruiser. It is only a few weeks since Commodore McNair declared to the Review his belief that the armored cruiser is the "best all-around fighting ship in the world," and this opinion is shared almost invariably by his confreres of all grades. It has always been in a great degree inexplainable, too, why the United States should have abandoned the construction of a type of vessel which she originated, and regarding whose qualities she might naturally be expected to be reasonably well informed, while other nations took up the idea and elaborated it, apparently with marvelous success.

However, whatever question, if any, there has been as to the fighting qualities, speed benefit and general efficiency of the armored cruiser type, has been effectually answered by the naval engagement at Santiago, where the Brooklyn, the most modern and most powerful of our two armored cruisers, bore the brunt of the battle, fired more shells in return than all the other American vessels combined, and finally developed speed that enabled her to with ease overhaul the Cristobal Colon, commonly supposed to be one of the swiftest protected cruisers in the world. Officers of the Spanish fleet, who gave themselves up after the battle, have since stated that the orders of the Spanish commanders contemplated a concentration of the fire of all the vessels of Cervera's fleet on the Brooklyn, on the theory that her disablement would facilitate their escape before the return of the New York, the other armored cruiser of our fleet, which was some miles distant at the time the Spanish vessels attempted to escape. That the orders regarding the Brooklyn were in so far as possible carried out was apparent to the officers on the other American vessels, as well as to the men on the Brooklyn. The magnificent fight which that vessel made against these odds will ever remain the best testimonial of this type of ship. An inspection of the hulls of the Spanish vessels by an examining board gives the following aggregate result as to number of hits: Four-inch shells, (fired only by the Iowa), Infanta Maria Teresa, one; Almirante Oquendo, five; Vizcaya, two, total, eight. Five-inch shells (fired only by the Brooklyn), Infanta Maria Teresa, five; Vizcaya, six; Almirante Oquendo, five, one of which exploded a torpedo; Cristobal Colon, four; total, twenty. Eight-inch shells (fired by the Brooklyn, Iowa, Oregon and Indiana), Teresa, three; Oquendo, three; Vizcaya, four; total, ten. Inasmuch as the Indiana did not take part in the pursuit, it is unquestionably safe to exclude her from credit for any of the four shells which



United States Revenue Cutter Manning, Now of the Navy—Formerly Stationed at Boston, Mass.

The Revenue cutter Manning, formerly in service on the Atlantic coast, had the honor of accompanying the Gussie on the first expedition of the war to Cuba. The object was to convey arms and ammunition to the insurgents, but the men landed from the Manning were driven back by Spaniards in force, but not before they had raised the first American flag on the island.

reached the Vizcaya. Twelve or 13-inch shells (fired by the Oregon, Indiana, Texas and Iowa), Teresa, two. It will thus be seen that the Brooklyn landed just twice as many 5-inch shells as all the American vessels in the engagement, herself included, did 8-inch ones, and also twice as many 5-inch projectiles as the aggregated 4, 12 and 13-inch shells from the other vessels. In short, the Brooklyn with her 5-inch batteries landed on the enemy's fleet as many projectiles of this caliber as the aggregate of missiles of all other calibers fired from all four battleships which took part with Commodore Schley's vessel in the engagement. The very even distribution of the shells from the Brooklyn among the enemy's vessels proves conclusively the claims of her officers that she fought each of Cervera's cruisers in succession. Moreover, the Brooklyn is entitled also to a share of the credit for the hits by 8-inch shells, although the above reckoning was based merely on the cruiser's work with 5-inch projectiles, in order to simplify the comparisons made. The ten 8-inch shells must, of course, be accredited to the four vessels firing them, but there is a practical certainty that at least two of them—those which struck the Vizcaya—were fired from the Brooklyn.

The impression prevails in some quarters that the Brooklyn and New York, the sole representatives of the protected cruiser type in the American navy, are sister ships and identical in dimensions and armament, but such is far from being the case. The Brooklyn was designed to embody the possibilities for improvement which were made apparent in the construction of the New York, and thus an increase of size, speed and coal endurance was secured in the new vessel. The Brooklyn is 400 feet over all, as against 380 feet, the length of the New York, although both have a beam measurement a fraction under 65 feet. The displacement of the Brooklyn, 9,215 tons, exceeds that of the New York by over 1,000 tons, and yet her draught is only 9 inches more than that of the older vessel. The New York on her trial developed a speed of 21 knots, and the Brooklyn exceeded this by almost a knot. The armored cruisers have unquestionably the most distinctive appearance of any of the vessels of the American navy, by reason of their high freeboard and three stacks, which, in the case of the Brooklyn, are of exceptional height, on the theory of added advantage in furnace draft.

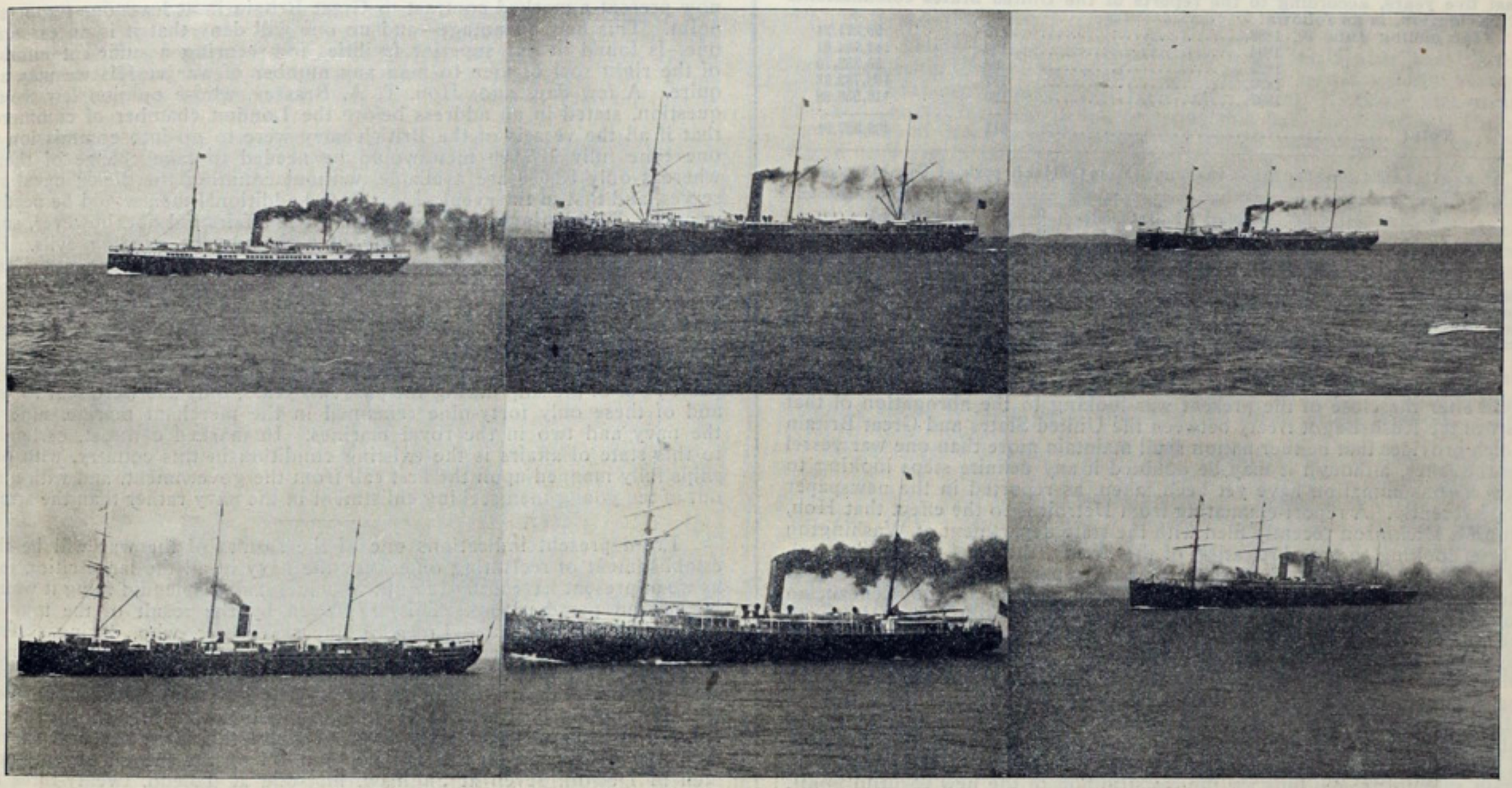
Those students of naval science who have inveighed against the $4,000,000-battleship on the ground of expense, and have argued for the construction of more and less expensive vessels, may now be expected to become earnest advocates of the armored cruiser type, and certainly there would seem to be much to be said in favor of a class of vessel, which, while costing under contract less than $3,000,000, is capable of displaying the efficiency in fighting that the Brooklyn did at Santiago, for it must be remembered that not only did she outshine the battleships in the vigor of her aggressive work, or at least in the quality of her marksmanship, as shown above, but that the statement has not yet been denied that she was hit forty times during the engagement. Even with the authenticity of this latter claim discounted liberally, there would seem to still remain conclusive evidence that the vessel is not inadequate in defensive qualities.

The Brooklyn was built in 1893-96 by the William Cramp & Sons' Ship & Engine Building Co. of Philadelphia, who are naturally very much elated by the showing which the vessel made at Santiago. The contract for the vessel called for the maintenance of a speed of 20 knots for four hours' steady steaming, with a proviso that a premium of $50,000 should be paid the contractors for every quarter knot in excess of this stipulation attained on the trial trip. As the Brooklyn attained a speed of 21.91 knots, the Cramps secured the handsome premium of $350,000.

Naval experts all over the world have naturally made a very careful study of the armor and armament of our armored cruisers ever since we originated the type, and now in all probability this interest will be renewed. The Brooklyn's protective deck extends the entire length of the ship. Over the machinery space it consists of two layers of 1½-inch steel plating, and forward and aft of this the total thickness of the two plates is nowhere less than 2½ inches. The side armor, which extends from 4 feet above to 4 feet below the water line for a length of 192 feet opposite the engine and boiler rooms, is 3 inches in thickness. The barbette armor of the 8-inch turrets is 8 inches in thickness and like the side armor of Harveyized nickel steel, while the turret armor has a thickness of 5½ inches. The armament of the vessel consists of eight 8-inch guns mounted in pairs in four turrets, twelve 5-inch rapid-firers, twelve 6-pounders, four 1-pounders and four machine guns. To the advocate of the efficiency of the rapid-fire batteries to the exclusion of heavier ordnance it seems an ideal armament.

The engines are, of course, a great factor in an armored cruiser, as may be imagined from the original estimate on the cost of the Brooklyn, which allowed for an expenditure of $986,000 for machinery. The Brooklyn has her power of propulsion furnished by four vertical direct-acting, three-cylinder, triple-expansion engines of 18,248 indicated horse power. There are two engines on each shaft, and four taper coupling bolts, the coupling being of the ordinary disk type, instead of the disconnecting coupling with which the New York is equipped. Steam is supplied from five double-ended and two single-ended steel boilers, each 16 feet 3 inches in diameter. The single-ended boilers have a length of 9 feet 5 inches, while the double-ended boilers range from 18 to 20 feet. All have a working pressure of 160 pounds per square inch. The engines and boilers are all placed in water-tight compartments. The forward and starboard turrets are turned by electricity, while steam is the motive power for the port and after turrets. The opportunity for a comparison of these two methods has been one of the best opportunities for practical demonstration which has been afforded the officers of our navy in some time.

It has been far from the intention of this article to make any reference to the Brooklyn to the disparagement of the New York. The position which the latter occupies in our navy, and the estimate in which she is held by its officers, as well as by the department at Washington, is fully demonstrated by the service to which she was assigned, both before and during the present war. There is no reason to doubt that had not the force of unfortunate circumstances prevented her participation in the recent engagement, she would have given quite as good an account of herself as the Brooklyn, and that the showing made in speed and fighting ability would have been very nearly if not quite as creditable as that of the newer cruiser.



Pacific Mail Steamship Co.'s Fleet in Service as Transports—These Vessels Carried Gen. Merritt's Troops to Manilla.

COLON. CITY OF SYDNEY. CITY OF PARA. PERU. CITY OF RIO DE JANEIRO. CHINA.

A few naval officers may have complained against the according to Commander William G. Randle and Chief Engineer John Walls of the American liner St. Louis of full naval rank when the St. Louis went into service as an auxiliary cruiser, but the action was assuredly endorsed heartily by the general public. We are not willing to admit with some enthusiasts that the plan should be followed in the case of all auxiliary cruisers, but there are many cases where, exercised with judgment, such an acknowledgement would serve as a valuable encouragement to officers of ability.

At the Bath Iron Works at Bath, Me., the keel was laid, this week, for a United States practice vessel for the use of the naval cadets at Annapolis. The vessel, which will be 192 feet in length, will be of steel, planked below the water line and 26 inches above. It is the first vessel of the kind constructed by the government in some time.

MARINE REVIEW

DEVOTED TO LAKE MARINE AND KINDRED INTERESTS.

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The books of the United States treasury department on June 30, 1897, contained the names of 3,230 vessels, of 1,410,102.60 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons, and over that amount, on the lakes on June 30, 1897, was 399, and their aggregate gross tonnage 769,366.68; the number of vessels of this class owned in all other parts of the country on the same date was 314, and their tonnage 685,709.07, so that more than half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1897, was as follows.

	Number.	Gross Tonnage.
Steam vessels	1,775	577,235.45
Sailing vessels and barges	1,094	594,888.87
Canal boats	361	37,978.28
Total	3,230	1,410,102.60

The gross registered tonnage of the vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

Year ending June 30, 1893	175	99,271.24
" " " 1894	106	41,984.61
" " " 1895	93	36,352.70
" " " 1896	117	108,782.38
" " " 1897	120	116,936.98
Total	611	403,327.91

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC. (From Official Reports of Canal Officers.)

	St. Mary's Falls Canals.			Suez Canal.		
	1897	1896	1895	1897	1896	1895
Number of vessel passages	17,171	18,615	17,956	2,986	3,409	3,434
Tonnage, net registered	17,619,933	17,249,418	16,806,781	7,899,374	8,560,284	8,448,383
Days of navigation	234	232	231	365	365	365

There would appear to be little doubt that some action will be taken soon after the close of the present war looking to the abrogation of that part of the Rush-Bagot treaty between the United States and Great Britain which provides that neither nation shall maintain more than one war vessel on the lakes, although it may be doubted if any definite steps looking to such a consummation have yet been taken, as reported in the newspaper press recently. A report emanating from Detroit is to the effect that Hon. Don M. Dickinson recently filed with the state department at Washington a brief looking to the abrogation of this treaty, the brief being identical, or at least very similar, it is said, to that prepared by Mr. Dickinson at the time of the dispute with Great Britain regarding the Venezuelan boundary, but not at that time brought into requisition. In a letter to the Review, Mr. J. B. Moore, acting secretary of the department of state, says that no such paper has been filed with the department, while Mr. Dickinson, to whom an inquiry was also addressed, says he gave out nothing whatever concerning the matter, although he does not deny the existence of such a brief. There is evidently a dispositon among representatives of influential interests in this country to again take up this question. If lake ship builders attract attention to the facilities of their plants by again submitting low bids for the construction of the new torpedo boats, additional cause will be presented for action in the matter. The Canadians are also speculating upon the probability of such a turn of affairs, and seem desirous of leaving the whole question for settlement to the Quebec commission and the United States commissioners, who are to attempt to adjust points of commercial difference between the two countries to the advantage, if possible, of both. Regarding the abrogation of the treaty the Canadians have little to say, and sensibly so, for it is provided that the agreement may be abrogated upon six months' notice by either nation, but in discussing the project for a deep waterway from the lakes to the ocean, which they also seek to have referred to this joint commission, our friends across the border have a great many suggestions at hand. One of these is the advancement of the argument—and they have begun it already—that if American warships are to be built at the lake ship yards, and these war vessels, as well as American shipping generally, are to have the full and free use of the Canadian canals and waterways, the United States should reciprocate by granting Canadian vessels free participation in our lake and coasting trade. When we take into consideration the great desire, lately amounting to an ambition, in Canada to build up an inland marine in return for enormous expenditures on canals, the aim of this kind of argument is quite apparent. It might be well to suggest, however, that the privilege of sending war vessels from the lakes to the Atlantic coast, or even the greater advantage of joint ownership in an enlarged St. Lawrence waterway, would not be sufficient to tempt the people of this country to give up any part of the wise coasting regulations that have built up in the United States a home marine unequaled elsewhere in the world.

Everybody who is acquainted with the jealousy existent between the line and staff officers of the United States navy, and the many unsuccessful efforts made for a lessening or obliteration of the feeling, is naturally skeptical as to the outcome of any further attempt in this direction, but there is much to hope for, nevertheless, in the new plan to accord to staff officers actual rather than relative rank. But for the outbreak of the war this subject, which was so well presented to the last congress, would already have been given full consideration. The Review is not over-sanguine of the acceptance by congress of the plan agreed upon in the department, but it believes that if the question is to be disposed of at all, this is the only practicable solution of it. The staff officers will accept nothing less. The line officers, on the other hand, need not be expected to relinquish in any degree the care with which they have guarded their right to command, but of course there need be no disagreement here, for the new plan does not contemplate the extension of that privilege to the staff. Another commendable feature of the reorganization is the proposition to abolish the rank of commodore, except for special purposes, such as the command of a small squadron or the chiefship of a departmental bureau. The commanders of our fleets have frequently been subjected to inconvenience, occasionally to small annoyances, from the fact that the rank of commodore was inferior to that held by the commanders of the European fleets encountered, and the only wonder is that, considering the simplicity of the remedy, it was not effected sooner. Then, too, this new plan, which on the face of it seems to be a veritable cure-all, will, it is believed, prove remedial in a great degree of the stagnation of promotion, which has long been, rightfully, a cause of more or less discontent among the officers of our navy. The present is the day of the young man in business, and we believe that most Americans will agree with Admiral Farragut that it ought to be the day of the young man in the navy as well. One hundred and fifty lieutenants who have been twenty-five years in the service, and a proportionately large number of ensigns who have not risen from that rank in fifteen years' service, is not a showing to arouse pride, and there should certainly be no dissent with the proposition to make it impossible for a man to remain longer than three years in the rank of ensign.

Whatever may be said of the previous apathy of the United States in naval matters, the arousal of patriotic interest by the war enables us to now present a marked contrast to Great Britain in at least one important point. This new advantage—and no one will deny that it is an essential one—is found in our superior facilities for securing a sufficient number of the right sort of men to man any number of war vessels we may acquire. A few days ago, Hon. T. A. Brassey, whose opinion few would question, stated in an address before the London chamber of commerce that if all the vessels of the British navy were to go into commission at one time fully 105,000 men would be needed to take charge of them, whereas only 98,000 are available, without counting the 27,000 naval reserves, and that in the event of war 50,000 additional men would be needed at once. The distinguished expert on naval affairs did not, however, suggest anything original in the way of a remedy for existing evils. He advocated strengthening the navy by a system of state apprenticeship, and condemned the short service system at present in vogue. The British public is thoroughly aroused on this subject, and there was a most vehement and prolonged protest when Maj. Skinner, as chairman of the London school board's training ship Shaftesbury, recently, at the request of the home secretary, prepared statistics which showed that of the 425 boys passed out of the ship during the past two years, only 206 were sent to sea, and of these only forty-nine remained in the merchant marine, nine in the navy and two in the royal marines. In marked contrast, certainly, to this state of affairs is the existing condition in this country, with our ships fully manned upon the first call from the government, and with nine out of ten young men seeking enlistment in the navy rather than the army.

From present indications one of the results of the war will be the establishment of recruiting offices for the navy in all the large cities, just as we at present have army recruiting offices, and a splendid thing it would be beyond peradventure. This is proven by the result of the tour of Commander Hawley and Chief Engineer Webster, who, during several weeks past have been engaged in the west and south, stopping a few days at each place, in order to afford an opportunity of enlistment to any young men who might desire to join the navy. The report of the tour, just filed with the navy department at Washington, shows that fifty-six men were enlisted at New Orleans, sixty-seven at Galveston, sixty-seven at Cleveland, 192 at Chicago on the first trip and 471 on the second, seventy-one men in Detroit, seven at Saginaw, fifty-one at Toledo, twenty-three at Cincinnati, thirty-three at Milwaukee, twelve at Port Huron, 146 at Moline, fifty-eight at Quincy, fifty-three at Alton and ten at St. Paul. There is also welcome news in the announcement that a recruiting office for the navy is to be established at Honolulu. In days gone by many of the most efficient seamen that manned the whalers came from the Hawaiian islands, and the grit and pluck which these seamen displayed then is just the sort which is required in the men on America's fighting vessels.

There appears to have been during the present conflict just a trifle too much anxiety to give all the credit for the achievements of the United States navy to "the man behind the gun." It doesn't seem to have occurred to a great many people, influenced in some cases by writers who ought to know better, that the men behind the gun would have been able to accomplish but very little if they had not had the assistance of other men on the ships, even down to the stokers, who, according to all accounts, worked during the chase at Santiago as stokers never worked before. It was not the "man behind the gun" who took the Merrimac into the channel at the entrance to Santiago harbor; it was not "the man behind the gun" who enabled the battleship Oregon to keep close behind the speedy cruiser Cristobal Colon; and so we might go on naming almost innumerable evidences that would support a claim for credit where credit is due.

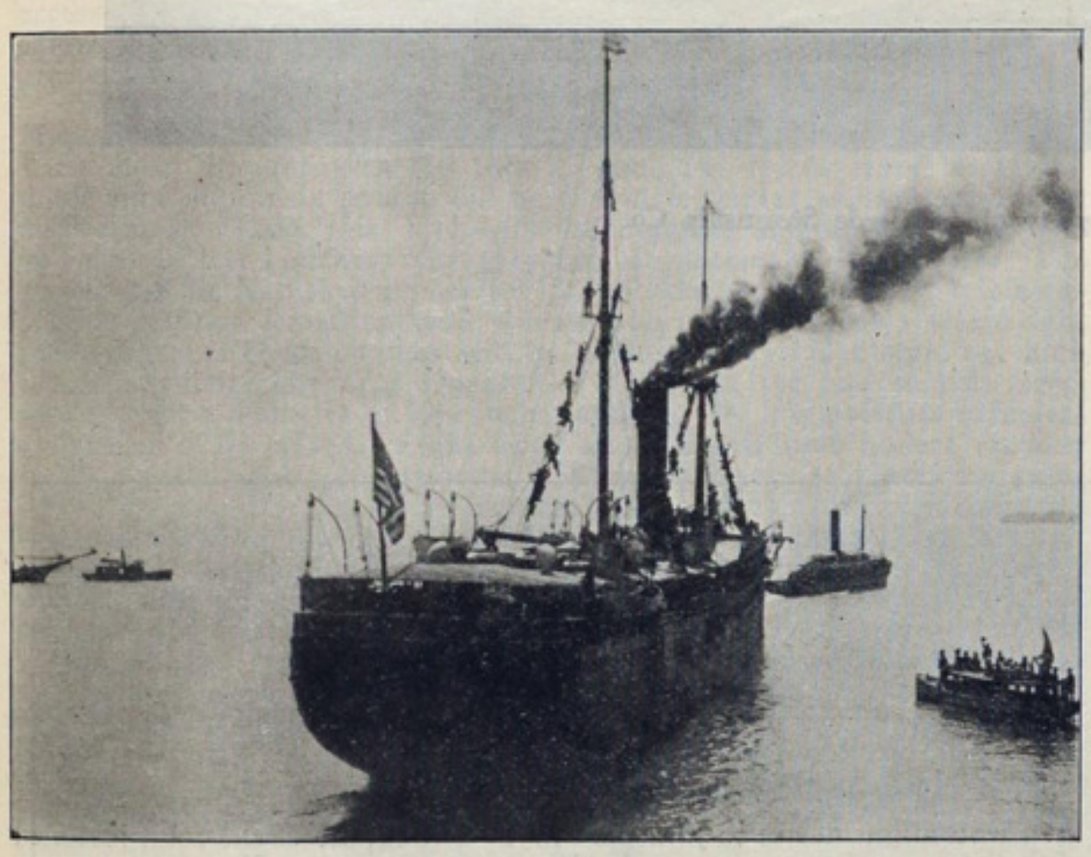
It was a very pretty ceremonial in which the Duchess of York was the central figure at the recent launching of England's newest battleship, the Albion. A royal salute was fired, and after a short religious service had been read, a silver-handled knife was presented to the duchess, who cut a red, white and blue cord, to which heavy weights were suspended above the dog shores which held the hull. Then the proverbial bottle of wine was broken on the ship's bows—only, however, after three unsuccessful attempts—and the bands played, the crowd cheered and the whistles shrieked as the monster slid into the water. We may now expect an advocacy of a preliminary religious ceremony as a compromise to those well-meaning persons who have so persistently sought the abolition of the bottle of champagne as an adjunct of launches in America.

MONTEREY'S GREAT CRUISE.

REMARKABLE SEVEN-THOUSAND MILE JOURNEY OF THE BIG MONITOR FROM SAN FRANCISCO TO MANILA, PHILIPPINE ISLANDS.

Next to the famous journey 'round the Horn of the battleship Oregon, the most striking achievement of the war from the standpoint of the naval constructor and engineer was the journey of the monitor Monterey from San Francisco to Manila, to reinforce the squadron of Admiral Dewey. Especially is this true when it is considered that the Monterey was constructed only for coast defense and has a coal capacity of only 200 tons. Under less strenuous circumstances, this trip of the Monterey would not, in all probability, have been attempted, but Dewey must be reinforced, and with the Oregon off the Pacific there were not many vessels to choose from. So the Monterey was chosen largely no doubt because of her seagoing qualities, which were demonstrated in some considerable degree a few years ago when she made a cruise down the Pacific coast from San Francisco to Callao, Peru, traveling as high as 1,800 knots without stopping for coal. Then, too, the Monterey, while not as large as the Puritan, is larger than the Terror, Miantonomoh, Monadnock or Amphitrite, and carries as heavy an armament as any of them.

It was the problem of coal, however, which gave the navy department greatest concern in planning this unique trip. The Monterey has a normal coal capacity of only 200 tons, and so it was planned that after her coal supply gave out she should be towed by the collier Brutus to Honolulu. From Honolulu to Honk Kong, a distance of 4,961 miles, it was estimated she would, on the most favorable allowance, be obliged to coal four times. The operation of coaling at sea is fraught with danger and sure to entail more or less delay, but there seemed to be no other plan devisable. The operation of filling the bunkers to their capacity was to be repeated at Hong Kong on the same plan as at Honolulu. The Monterey and the collier Brutus sailed from San Francisco at noon on June 6.



TRANSPORT NEWPORT LEAVING SAN FRANCISCO FOR MANILA

Before leaving, the Brutus received special towing bitts and a "bridle" of 4¼-inch wire cable, 360 feet long, to go half way around the ship and be made fast to the forward and midship bitts, with a pelican hook at the bow, which could be made to release the ship from the tow in an instant should heavy weather or the presence of a hostile ship necessitate. The journey was fraught with many trying, if not discouraging, circumstances. The Monterey had 200 tons of coal on her deck, and when one day out from San Francisco 80 tons of it was washed away. It was demonstrated that the Monterey cannot carry coal to steam much more than 2,000 miles, and it was also shown that, even with the special apparatus which she had and the stoutest Manila lines, such a vessel could not be towed successfully for any considerable distance. After departing from San Diego June 10 the vessel encountered a heavy northeast swell. Her decks were under water most of the time and progress was very slow. Five days out, less than 50 tons of coal remained in the bunkers of the monitor, and the Brutus took her in tow. On the evening of the same day the great cable parted at the Monterey's bit, having literally sawed itself asunder. It was late the next morning before the vessels got under way again. A few hours out of Honolulu the tow line was cast off and the Monterey entered the harbor an hour ahead of the Brutus. There was a delay for repairs at Honolulu and the remainder of the journey was not so eventful.

Although the Monterey is of practically the same dimensions as the monitor Monadnock, which has also joined Dewey's squadron after an interesting trip from San Francisco, greater interest attaches to her achievement than to that of the Monadnock, by reason of the Monterey's greater displacement and more limited coal capacity. The difference in this latter respect—and of course in this particular trip it was the most important one—will be appreciated when it is stated that when the Monadnock sailed from San Francisco on June 23 she had on board 360 tons of coal besides 100 tons on her deck. The Monterey is another of the vessels built by the Union Iron Works of San Francisco, the builders of the battleship Oregon. The contract was let in 1889 and she was completed early in 1893. The Monterey is 256 feet in length, 59 feet beam, and 14 feet 10 inches draught. She is constructed entirely of steel. Her armor belt is 13 inches in thickness amidships, tapering to 8 inches at the bow and 6 inches at the stern. Her twin triple-expansion engines indicated 5,244 horse power on the trial trip. The cylinders are 27, 41 and 64 inches in diameter by 30 inches stroke. Four coil or tubulous boilers give a collective horse power of 4,500, while two cylindrical boilers suited to work at 160 pounds pressure, are designed to, if desired, propel the vessel at a speed of 10 knots. The armament consists of two 12-inch guns, two 10-inch breech-loading rifles, six 6-pounders, four 1-pounders and two machine guns.

In conclusion something should be said of the Monterey's commander, Lieutenant Commander E. H. C. Luetze, who will perhaps be remembered by such of our readers as reside in the vicinity of the great lakes, by reason of his recent occupancy of the position of commander of the U. S. S. Michigan, the only United States war vessel on the great lakes. He was also for a time inspector of one of the light-house districts on the lakes. Commander Leutze is a mild-mannered man, of small stature, but there is no more severe disciplinarian in the navy and no officer who more thoroughly understands his work or is more in love with it. It was during his connection with the light-house service on the lakes that he was given the grade of commander. It is indeed remarkable that this officer, who is at the bottom of the list of commanders, has a command more important than any other officer of his grade in the navy. All the other monitors in service are commanded by captains.

FROM THE CZAR'S DOMAIN.

IRVING M. SCOTT, BUILDER OF THE BATTLESHIP OREGON, NOW AFTER RUSSIAN CONTRACTS, WRITES FROM ST. PETERSBURG A FEW NOTES OF HIS IMPRESSIONS IN RUSSIA.

In the height of the war excitement, and shortly after the United States battleship Oregon had distinguished herself by a wonderful voyage from San Francisco 'round Cape Horn, Mr. Irving M. Scott, vice-president and general manager of the company that built the Oregon,—Union Iron Works of San Francisco—departed for St. Petersburg, with the object of securing, if possible, a contract for some of the vessels provided for in the new naval program of the czar's government. Nothing approaching this latter in magnitude has been known in the history of the world. The Russian program contemplates the building within seven years of eight first-class battleships, six cruisers of 6,000 tons each, ten cruisers of 3,000 tons each, one submarine mine transport of 6,000 tons, twenty torpedo boat destroyers and thirty torpedo boats. This project, necessitating as it does an expenditure aggregating more than $250,000,000, has naturally turned upon Russia the eyes of the naval world, and as a representative of American ship building at the scene of this activity a new interest attaches to Mr. Scott and his observations. He favors the Review with a short letter from St. Petersburg but refrains from saying anything about Russian naval affairs or the result of his mission. Mr. Scott writes as follows:

Editor Marine Review:—While my residence here is short and my observation superficial, I have been most agreeably surprised with the great industrial activity everywhere apparent. Nothing can delay or prevent the forward march of this great nation, nor retard the good effects sure to be produced by the army of technical experts now being educated in every department of civil life. The building of 7,000 miles of railroad in one continuous line and its concomitant supplies causes an activity in manufactures and mechanical devices that is not fully comprehended in our country. Facilities now exist and are in daily operation competent to build 500 locomotives per year; the road from Moscow to Vladivostock and Port Arthur demands 200 more, which are supplied from various places. America is getting her share.

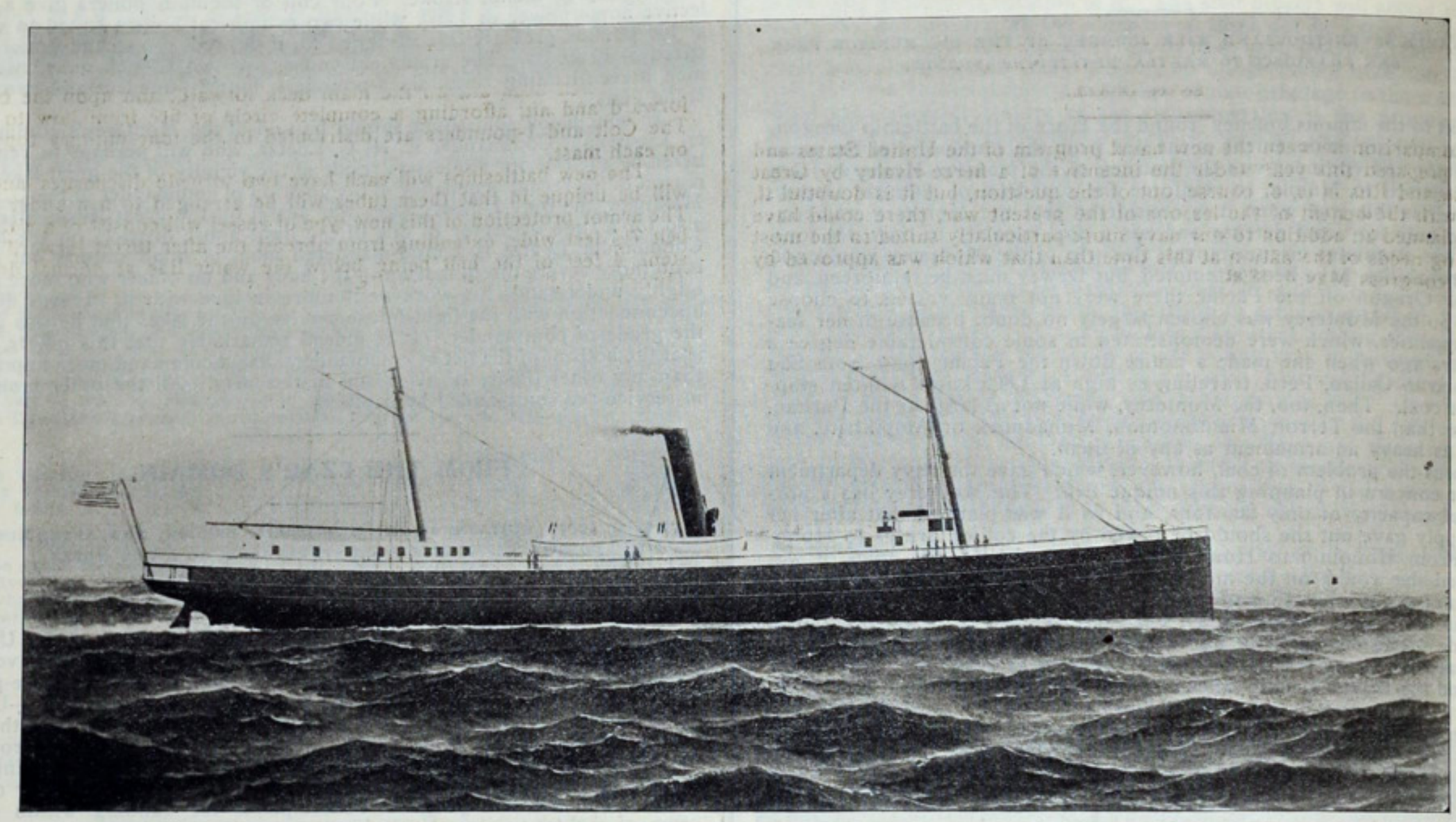
Russia is getting all of her pig iron, steel, armor plates and guns from her own furnaces, shops and plants in the southern part of her immense domain; also coal of splendid quality in inexhaustible quantities. She has immense mineral oil deposits and all of the precious minerals and many of the gems, with varieties of porphory, jasper and granite of all grades. Her people—85 per cent. being as yet agricultural—are thrifty and frugal and seem to be as happy as those in any country I have visited. While policemen are in easy distance, they are civil and unofficious to strangers, kind and considerate to the people. The paternal nature of the actual government causes it to take an active and careful interest in all its subjects. Murder is seldom committed. The criminal class, well restrained, are allowed their liberty in the daytime, but compelled to report at 9 o'clock at night. We have never seen a pickpocket, a street fight or disturbance, and have felt no restraint of any kind.

I have been at the Reterhoff while the Czar's band was playing and saw the best people of the highest class; at Moscow witnessed the race of the season, with the spectacle of all the well-to-do class in the full sweep of enjoyment, and finally visited Sparrow Hill on a holiday and saw the peasant class in all phases of fun and hilarity, with an occasional inebriated person. In all these several classes, however, nowhere was there visible any officious restraint, but everywhere intelligent and kindly direction and protection. Streets are clean, vehicles observe regular rules in entering and leaving a street, and all animals come up to you without fear, evidencing the fact that kindness has characterized their treatment. The drosky men drive rapidly, but you rarely see any means used to urge the horses, save that afforded by the lines and a sharp pull on the bit. They are driven without blinds, and many of them are splendid animals, with a true trotting gait. The accumulations of the great rulers of the past are housed in what was once their palaces, now museums, open free to all classes, wihtout any fee of any kind except what is voluntary. The priceless treasures of the past have been thus preserved to this age and are well housed. Art is well established. The figure and historical painting is in advance of that in America, but the marine and landscape not up to our ideal.

The harsh and historical Russia is gradually being succeeded with much considerate care for all the people, municipalities having a representative government. Trials are by jury, from service on which no one in the village is exempt save officers. Along with the past: the leven of modernism upward-tending.

IRVING M. SCOTT.

St. Petersburg, July 22, 1898.



Steamer Cherokee, Formerly the Property of the Clyde Steamship Co.

FOR DESCRIPTION SEE PAGE 27.

Olivette, La Grande Duchesse, Halifax, and Mascotte of the Plant Line.

FOR DESCRIPTION SEE PAGE 27.

OUR LATEST NAVAL VESSELS.

BATTLESHIPS, MONITORS, TORPEDO BOATS AND DESTROYERS AUTHORIZED BY THE MOST LIBERAL OF NAVAL APPROPRIATION BILLS—TWENTY-FIVE SHIPS IN ALL.

Comparison between the new naval program of the United States and those prepared this year under the incentive of a fierce rivalry by Great Britain and Russia is, of course, out of the question, but it is doubtful if, even with the benefit of the lessons of the present war, there could have been planned an addition to our navy more particularly suited to the most pressing needs of the nation at this time than that which was approved by act of congress May 4, 1898.

The naval appropriation bill passed on the date mentioned makes provision for the construction of three first-class battleships, four coast defense monitors, twelve torpedo boats and sixteen torpedo boat destroyers. Two desires influenced the officials of the navy department—an anxiety to have these new vessels under construction as expeditiously as possible and an equal desire to insure their completion at the earliest possible date, and these induced a plan to have the new battleships conform in a general way to the first-class battleships Alabama, Illinois and Wisconsin, now under construction by the William Cramp & Sons' Ship & Engine Building Co. of Philadelphia, the Newport News Ship Building & Dry Dock Co. of Newport News, Va., and the Union Iron Works of San Francisco, respectively. In detail, however, there is a wide divergence in the plans of the two classes of vessels, the officials of the bureau of construction naturally having taken advantage of many possibilities for improvement disclosed during the construction of the battleships of the Alabama class, as well as the results of the latest engineering experiment. A distinctive feature, however, which has been retained without modification is the light draught, which was adopted for the Alabama, Illinois and Wisconsin, in order that they might be enabled to operate in waters inaccessible to foreign war vessels of equal armament, and which, with the exigencies of our probable territorial extension considered, will be of even greater value in the new vessels than in those now building.

The new battleships, which will be known as the Ohio, Maine and Missouri, will be 368 feet in length by 72 feet 2.5 inches extreme beam. Their mean draught with 800 tons of coal, two-thirds stores and two-thirds ammunition on board, will be 23 feet 6 inches; and corresponding displacement, 11,525 tons; and with full supplies and 1,200 tons of coal on board, 24 feet 7 inches; corresponding displacement, 12,140 tons. The vessels will be furnished power for propulsion by two sets of triple-expansion engines, actuating twin screws, and each in its own water-tight compartment. These engines will be of the four-cylinder type, the high pressure cylinder having a diameter of 30 inches, the intermediate pressure cylinder a diameter of 46½ inches and the two low pressure cylinders a diameter of 53 inches. Eight large single-ended steel boilers, in four separate water-tight compartments, will supply steam at a working pressure of 210 pounds. This is an increase of 30 pounds over the steam pressure demanded in the case of the boilers for the Alabama, Illinois and Wisconsin. The indicated horse power of each of the new battleships will be 10,000, and the contract specifications stipulate a speed of 16 knots per hour. In deference, however, to the demand for greater speed in these vessels, which for weeks past has been emphasized with all possible stress by Engineer-in-Chief George Melville of the bureau of steam enginering of the navy department and many lesser authorities, the department decided a couple of weeks ago to take such steps as it could consistent with the original plans to secure greater speed. Accordingly the following circular was issued: "The department will, in awarding contracts for the construction of battleships Nos. 10, 11 and 12, under its advertisement of June 17 last, give preference, other things being equal, to such bids as offer to guarantee the highest rate of speed and the greatest coal endurance, the total weights of engines, boilers and coal, and the spaces allotted therefor, to remain as now fixed by the circular defining the chief characteristics of said vessels and the department plans and specifications, and the vessels to have a steaming radius of not less than 5,432 knots at a speed of 10 knots per hour." The normal coal supply of the new battleships will be 800 tons; bunker capacity unpacked, 1,200 tons, with the possibility, under necessity, of stowing 500 tons of coal away elsewhere. The complement of each vessel—officers, seamen and marines—is given as 500 men.

The main battery of the battleships of this type will consist of four 13-inch breech-loading rifles, which upon an even keel will have an effective range exceeding 5 miles. The 13-inch guns will be mounted in pairs in two eliptical balanced turrets of the barbette type, so fashioned that they may be swung from side to side through their total sweep of 270 degrees without affecting the trim of the vessel. This is a decided advantage, as such a manœuver is essentially impossible with the unbalanced turrets with which many of our naval vessels are equipped. The 13-inch turrets will be of steel, 15 inches thick, except on the slanting face plate, which will be 2 inches thicker. This armor is Harveyized and will, it is claimed, prove the equivalent from a defensive standpoint of 25 inches of ordinary steel. The machinery for turning the turrets and the ammunition hoists will be protected by the barbette on top of which the turret revolves. The barbettes will be massive columns of steel nearly 30 feet in diameter and of a uniform thickness of 15 inches. It will also, of course, be face hardened similar to the turrets. Each of the barbettes rests on the heavy protected deck, which affords a perfectly solid foundation.

The secondary battery will consist of fourteen 6-inch rapid-fire guns, seven on each side of the vessel. The 6-inch guns will be placed on the upper deck amidships and on the main deck amidships and forward. The guns in the two citadels on the upper deck and those along the sides on the main deck will be protected by 6-inch armor, and each gun is stalled between splinter bulkheads of steel an inch and a half thick. Each of the 6-inch guns will also bear a heavy Harveyized shield, and the gun ports will be so fashioned as to give the greatest possible protection from projectiles. The two 6-inch guns to be placed well forward and just abaft the bow anchors will have a wider arc of fire than the four guns of the same caliber amidships, and will be able to fire dead ahead, as well as on each broadside. These guns, throwing 100-pound armor-piercing or explosive shells, will have a firing rate of five or six discharges per minute. There will also be an auxiliary battery of sixteen 6-pounders, four 1-pounders, one automatic Colt and a couple of field pieces for the use of landing parties. The 6-pounders, which are, of course, the weapons that would be called into requisition were it necessary to repel a torpedo attack, are mounted on the berth deck aft, on the main deck forward, and upon the bridges forward and aft, affording a complete circle of fire from bow to stern. The Colt and 1-pounders are distributed in the four military tops—two on each mast.

The new battleships will each have two torpedo discharges, and they will be unique in that these tubes will be arranged to fire under water. The armor protection of this new type of vessel will consist of a water line belt 7½ feet wide, extending from abreast the after turret forward to the stem, 4 feet of the belt being below the water line at normal draught. Throughout the length of the vessel amidships, from turret to turret, this side belt is reinforced by additional armor of a thickness of 16½ inches above the water line and 9½ inches below the water line. A broad band of corn-pith cellulose has been provided. A fighting station for the captain will be provided in a conning tower, 10 inches in thickness, just below the chart house and abaft the forward turret. An armored station 6 inches thick to the rear of the mainmast may be utilized either as a signal station or as a fighting position for the admiral. The vessels will be equipped with expensive electrical plants. The lighting of the ships and the search-lights will be electric and the turrets, ammunition hoists and fans are propelled by this power. The vessels will, of course, have complete auxiliary machinery and will be equipped with refrigerating and distilling plants. There will be separate electrical signal codes for each mast. The lower portion of each mast will be used for purposes of ventilation below decks. These new battleships will, it is expected, be built for $2,500,000 each, exclusive of armor and armament, and, as may be imagined from the above description, they will assuredly be worth all they cost.

THE HARBOR DEFENSE MONITORS.

The four harbor defense monitors, whose construction is authorized by the same bill, will be 225 feet in length on the load water line; extreme breadth, 50 feet; mean draught, 12½ feet on a normal displacement of 2,700 tons. The total coal capacity, loose stowage, will be 200 tons. The vessels, to be known as the Arkansas, Connecticut, Florida and Wyoming, will be driven by twin screws, and the engines, two in number, are to be of the vertical triple expansion type in one water-tight compartment. Four boilers of the water tube type, constructed for a working pressure of 250 pounds, will be placed in one water-tight compartment. The armament will consist of two 12-inch breech-loading guns, mounted in an armored barbette turret on the midship line forward; four 4-inch rapid-fire guns in broadside on the superstructure deck, and a secondary battery of seven rapid-fire guns. The electric generating plant is to consist of four units, each unit to have an engine, dynamo and combination bed plate, and each dynamo a rated output of 400 amperes at 80 volts. The total weight of the whole electrical installation, including dynamos, engines, bed plates and all fittings, wiring stores and two search-lights, must not exceed 32 tons. If on trial the average speed shall equal or exceed a speed at sea of 12 knots per hour for two consecutive hours, the vessel will be accepted so far as the speed is concerned. If the speed falls below 12 knots and exceeds 11 knots per hour, the vessel will be accepted at a reduced price, the reduction to be at the rate of $5,000 per ¼ knot deficiency of speed from 12 knots to 11½ knots, and at the rate of $10,000 per ¼ knot deficiency of speed from 11½ knots to 11 knots. If the speed falls below 11 knots an hour the secretary of the navy may at his discretion reject the vessel. The cost of these vessels, according to the provisions of the contract specifications, shall not exceed $1,250,000 each, exclusive of armament.

THE TWELVE TORPEDO BOATS.

Provision is also made in the bill for the construction of twelve torpedo boats and sixteen torpedo boat destroyers, the cost of all, not including armament, being estimated at $6,900,000. The new torpedo boats will be known as the Bagley, Barney, Biddle, Blakely, DeLong, Nicholson, O'Brien, Shubrick, Stockton, Thornton, Tingey and Wilkes. The torpedo boat destroyers will be named Bainbridge, Barry, Chauncey, Dale, Decatur, Hopkins, Hull, Lawrence, Macdonough, Paul Jones, Perry, Preble, Stewart, Truxton, Whipple and Worden. The department has, in the case of these vessels, made the seemingly very wise innovation of leaving to the bidders the preparation of plans and specifications for the hulls and machinery, or such portion of them as they may desire. According to the original plan, bids were to have been opened this week, but in order to accord fair treatment to the Pacific coast builders, it has been found necessary to defer the opening of the bids until next week. It is stipulated that not more than four of the torpedo boats and five of the destroyers shall be built by any one firm. The navy department has announced that in the consideration of bids especial attention will be given to the highest practicable speed guaranteed; to the designs showing the best seagoing qualities and giving the best protection to engines and boilers; and to the shortest time within which bidders will guarantee the completion of vessels. The torpedo boats must attain a speed of 26 knots and the destroyers must attain a speed of at least 28 knots. The cost of the torpedo boats is expected to average $170,000 each and of destroyers $295,000 each. All torpedo boats must be completed within twelve months from the time the contracts are let and all torpedo boat destroyers within eighteen months, so that it will be seen that the government is wisely putting an emphasis on the necessity for rapidity of construction. A failure to complete the vessels within the time limits given will involve penalties, which in the case of the destroyers will be $50 per day for the first month next succeeding the expiration of the period given, $100 per day for the second month, and $150 a day thereafter until completed. In the case of the torpedo boats the exaction will be $30 per day for the first month, $60 per day for the second month, and $100 a day thereafter until the vessels are delivered.

The torpedo boats will be of about 150 tons displacement, and under the contract specifications must not exceed 170 tons at a trial displacement. They are to have twin screws; vertical engines, placed in separate water-tight compartments, each with a condenser; water tubular boilers, and a bunker capacity for at least 40 tons of coal. The vessels will be lighted throughout by electricity and furnished with one search-light of an ap-

proved pattern. They are to be built staunch and strong for the service intended, of good freeboard and seagoing qualities and capable of operating at high speed in a moderate sea way. They are to have two conning towers, the forward one of which will be of ½-inch nickel-steel plates. The battery will be composed of three rapid-fire guns and mounts, weighing about 2 tons, with 3½ tons of ammunition. There will be mounted on deck three 15-foot torpedo tubes, with torpedoes, and stowage space below for two additional torpedoes and five war heads. Total of all ordnance weights will amount to about 13 tons. Berthing space will be provided for a crew of twenty-six men and three officers, and provision space for twenty days. The following weights are to be carried on trial in addition to completed hull and machinery, and spare parts, with fresh water necessary for trial: Ordnance, 9 gross tons; coal, 10 tons; crew, stores, equipments, etc., 8 tons; in all, 27 tons. If, on trial, the average speed of the torpedo boats for the two hours' run falls below the speed guaranteed by the bidder, they may be accepted by the department at a reduction at the rate of $3,000 for each quarter of a knot. If the speed falls below 25 knots the boat will be rejected.

The propelling engines will be of the vertical, inverted cylinder, direct-acting, triple-expansion type, each with a high pressure piston 14 inches in diameter, an intermediate pressure piston 22 inches in diameter, and two low pressure pistons each 25¼ inches in diameter; the stroke of all pistons to be 18 inches. The indicated horse power of the propelling engines will be about 3,000 when the engines are making about 350 revolutions per minute. There will be three water tube boilers constructed for a working pressure of 250 pounds per square inch. Two of these boilers will be placed in a water-tight compartment forward of the engines and the other one will be placed in a water-tight compartment abaft the engines, as shown. The total grate surface will be at least 137 square feet, and the total heating surface at least 7,544 square feet.

SIXTEEN TORPEDO BOAT DESTROYERS.

The torpedo boat destroyers will be of about 400 tons displacement, and on trial displacement must not exceed 435 tons. They are to have twin screws; vertical engines, to be placed in separate water-tight compartments, each with a condenser; water tubular boilers, and a bunker capacity for carrying at least 100 tons of coal, affording some protection to engines and boilers. The vessels will be lighted throughout by electricity and furnished with one search-light. They are to be built with good freeboard, good seagoing qualities, and designed to operate at high speed in a sea way. They are to have two conning towers, the forward one of which will be made of ½-inch nickel-steel plates. The battery will be composed of seven rapid-firing guns on deck or in conning towers, which, with their mounts and fittings, will weigh about 8 tons. The ammunition required will weigh about 7 tons. There will be mounted on the midship line two 20-foot torpedo tubes to carry 17-foot torpedoes, weighing in all 4 tons, and a space below will be required for stowing the two spare torpedoes and four war heads. Total ordnance weights will amount to about 24 tons. Berthing space will be required to accommodate a crew of sixty men and four officers, and provision space for twenty days. The following weights are to be carried on trial, in addition to completed hull and machinery, and spare parts, with fresh water necessary for trial: Ordnance, 15 gross tons; coal, 25 tons; crew, stores, equipments, etc., 12 tons; in all, 52 tons. If, on trial, the average speed of the torpedo boat destroyers for the two hours' trial falls below the speed guaranteed by the bidder, it may be accepted by the department at a reduction at the rate of $8,000 for each quarter of a knot. If the speed falls below 28 knots, the vessel will be rejected.

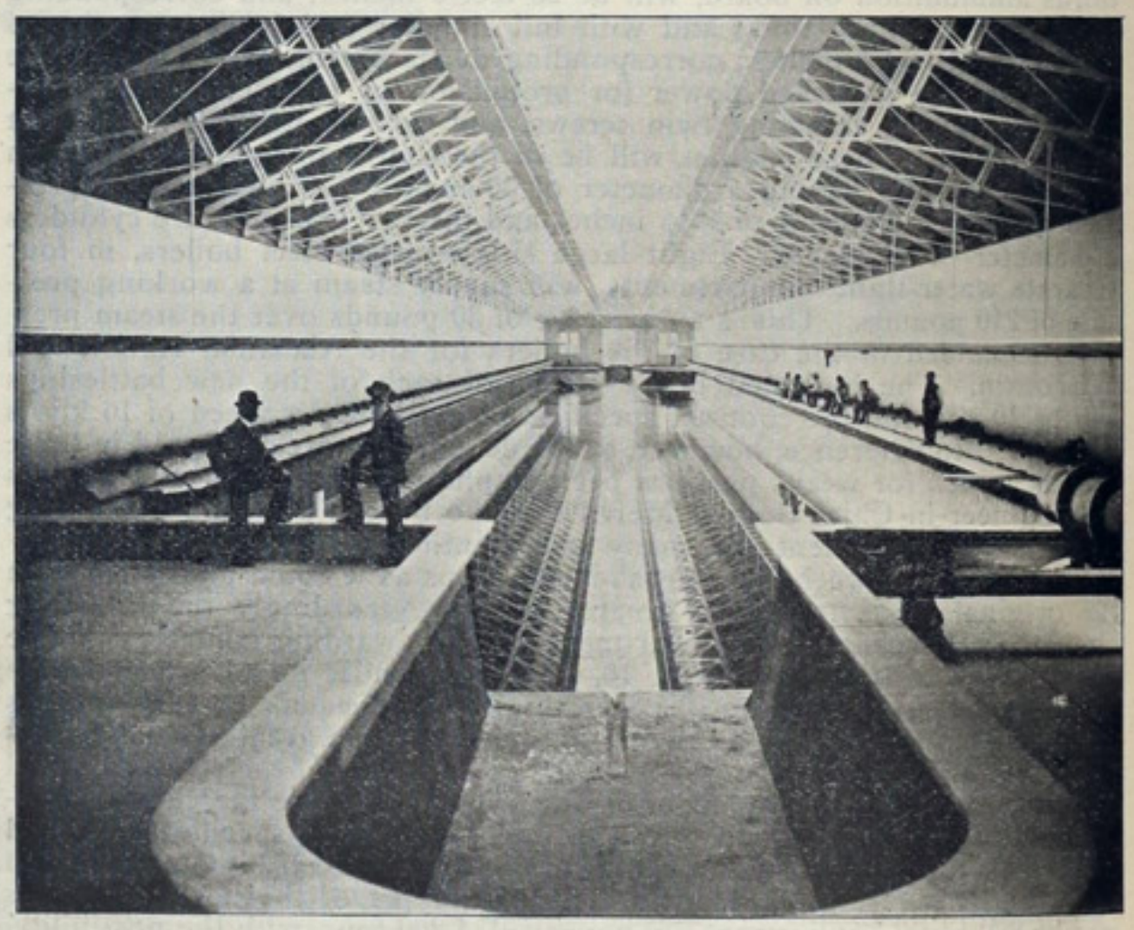
The propelling engines will be alike, and each will be placed in a separate water-tight compartment. These engines will be of the vertical inverted-cylinder, direct-acting, triple-expansion type, each with a high pressure cylinder 20½ inches in diameter, an intermediate pressure cylinder 32 inches in diameter, and two low pressure cylinders each 38 inches in diameter; the stroke of all pistons being 22 inches. The indicated horse power of propelling engiens will be about 8,000 when the engines are making about 327 revolutions per minute, the steam pressure at the engines being 250 pounds per square inch above atmosphere. The order of cylinders will be as follows, beginning forward: For the starboard engine, second low pressure, intermediate, high, and first low pressure; for the port engine, first low pressure, high, intermediate, second low pressure. The cranks will be at 90 degrees, the high and first low pressure cranks being opposite, as also the intermediate and second low pressure, the second pair being at right angles with the first pair. The weights of the pistons will be such as to make the weights of reciprocating parts the same for all cylinders, the weights of the air pump pistons and moving parts actuating them being taken into consideration. All the main valves will be piston valves, double-ported for steam, there being one for each high pressure, two for each intermediate pressure, and two for each low pressure cylinder. Each main piston will have one piston rod, with a crosshead working in a slipper guide. The framing of the engines will consist of vertical forged-steel columns, well stayed by diagonal braces. The engine bed plates will consist of a separate steel casting for each bearing, all supported upon and bolted to two fore-and-aft plates, which latter are supported by and form part of the engine keelsons, carefully and strongly worked into the framing of the vessel. The crank shafts will be made in two sections, and will be hollow. The shafts, piston rods, connecting rods, and working parts generally, will be forged of high-grade steel. There will be two condensers, made entirely of composition and sheet brass. Each will have a cooling surface of about 3,470 square feet, measured on the outside of the tubes, the water passing through the tubes. For each propelling engine there will be two double-acting vertical air pumps driven from the high and intermediate pressure crossheads. The circulating pumps will be of the centrifugal type, one for each condenser. The propellers will be right and left, of manganese bronze or approved equivalent metal.

There will be four water tube boilers, constructed for a working pressure of 300 pounds per square inch. Two of these boilers will be placed in a water-tight compartment forward of the engines, and the others will be placed in a water-tight compartment aft of the engines. The boilers in the after boiler compartment and the after boiler in the forward compartment will be alike, each containing about 80.5 square feet of grate surface; the forward boiler will not be as wide as the others, and will contain about 73.5 square feet of grate surface, the length of grates not exceeding 7 feet in all the boilers. The total grate surface will be at least 315 square feet, and the total heating surface at least 17,768 square feet. There will be four smoke pipes, one for each boiler; four main feed pumps, each of a rated capacity of about 150 gallons per minute; feed pumps will be located, one in each engine room, and one in each fire room. All these pumps will draw from the feed tanks and from the reserve water tanks and will deliver into the main feed pipe. The main feed pumps located in engine rooms will deliver into both the main and the auxiliary feed systems. The main feed pump in the after engine room will draw from the reserve water tanks through a separate pipe. Both main feed pumps in engine rooms will draw from the air pump channel ways. There will be two auxiliary feed pumps, one in each fire room, of the same capacity as the main feed pumps. They will draw from the feed tanks, the reserve water tanks, and the sea, and discharge into the auxiliary feed pipe, into the fire main, and the ash ejectors. There will be in each engine room a fire and bilge pump. These pumps will draw from the bilge, through the auxiliary drain, and from the sea, and deliver overboard and into the fire main. There will be two blowers in each fire room.

MODEL TANK FOR NAVY.

THE NOVEL APPARATUS FOR TESTING THE SPEED OF WAR VESSELS NOW NEARING COMPLETION AT THE WASHINGTON NAVY YARD.

The Review is enabled to present herewith the first picture that conveys an idea of the proportions and principal features of the tank now nearing completion at the Washington navy yard, regarding which so much has been written, and which is designed to enable the officials of the department to test the speed and determine the properties of war vessels by the use of models. It is several years since Chief Hichborn of the bureau of construction and repair began the advocacy of such a tank. He did not become discouraged by the apathy with which his efforts were so long regarded by congress. He pointed out the benefit that had been derived from the use of tanks of this character by some of the more progressive foreign nations, as well as the enterprise of the Clyde firm—Denny



THE NEW TANK FOR TESTING MODELS OF WAR VESSELS.

Bros. of Dumbarton—in constructing a private one, and finally about two years ago, Representative Hilborn of California, a member of the committee on naval affairs, took the matter before the house, and after a long struggle provision for an appropriation for constructing the tank was included in the naval appropriation bill.

The tank, which will be completed within a few weeks, is 300 feet long, 40 feet wide and 12 feet deep. It will be kept filled with fresh, clean water. A building which has already been completed covers the entire tank and excludes all drafts, while the water will be kept as free from currents as possible. At the side of the tank is a miniature railway, on which is a carriage that may be made to travel at any speed desired, power being furnished by its own electrical motor. Upon either this carriage or the model of the ship itself, if desired, may be placed the delicate mechanism destined to record the power in pounds needed to draw or pull the model through the water, mark the distance traveled and the time consumed. The presence of disturbing draughts or currents, no matter how slight, will also be registered, and checks and counter-checks have been provided so as to eliminate the possibility of error of any kind. The models of ships, which are to occupy the tank, will vary in size from 10 to 30 feet, and will be made of paraffin wax, it being claimed for this substance that it does not change its weight by absorbing water, is easily cut and readily molded to suit alterations suggested during the experiments. Moreover, the wax can be melted and remodeled an indefinite number of times. The original framework for the model is of wood; this is covered with canvas and then the paraffin is cast in the form of a complete covering. The original cast is, of course, somewhat in excess of the desired dimensions, in order that the wax may be smoothed, first by machinery and later by hand. Finally the little vessel is trimmed to the determined water line or draught.

The first experiments to be made will not deal with the models of war

vessels now building by the government or proposed for construction. It is admitted that the performances of the models in the tank will not prove exact criterions of the behavior of their prototypes on the ocean, and in order to determine once for all what proportionate allowance will have to be made in the application of all calculations from models to the presumed performance of full-sized vessels, the first experiments will be made with models of the present vessels of our navy. The comparison of the showings made by these models with the results of the actual performance of the vessels themselves will, of course, determine very accurately the relation, and this may be utilized as the basis of all future experiments. The determination of the conditions governing and attendant upon the matter of speed will be ascertained by towing the model, attached to the carriage, at several different rates of speed. Resistances are determined by means of the extension of a spring on the principal of ordinary hand scales, the amount of the extension being recorded in pounds on a revolving cylinder. On the same cylinder, timed to turn in accord with the speed of the carriage, are registered time and distance diagrams, which enable a correct registration of the rates of speed. From these results curves are plotted and the possible performances between the actual experiments registered without further trials. After the total resistance of the model has been determined, the various forms of propeller will be tried separately, and the one that shows the greatest equivalent in power of propulsion and efficiency for a like force in power applied will be accepted. Finally, the propeller will be tried in connection with the model, in order to enable the observation of the mutual action of screw and hull and to ascertain how far backward the suction of the working screw is exceeded by the forward push of the wake. This following current of water, the consequence of the hull and not the screws, and having a determinable speed, of course pushes against the backward thrust of the propellers, saves the screws that amount of work, and represents the conversion of a faulty motion of the water to so much helpful energy.

Moreover, there are numerous other ways wherein this new tank will be found valuable in the determination of quantities and forces which have heretofore been in a great sense a matter of speculation until after a warship has had her trial trip.

Transports in the War Service.

Scattered through this issue of the Review are a number of illustrations of the steamers purchased or chartered by the government for the transportation of troops. One of the most interesting of the fleet is the Cherokee, formerly the property of the Clyde Line, plying between New York and Jacksonville, Fla. The Cherokee has just served as the flagship of the expedition to Porto Rico.

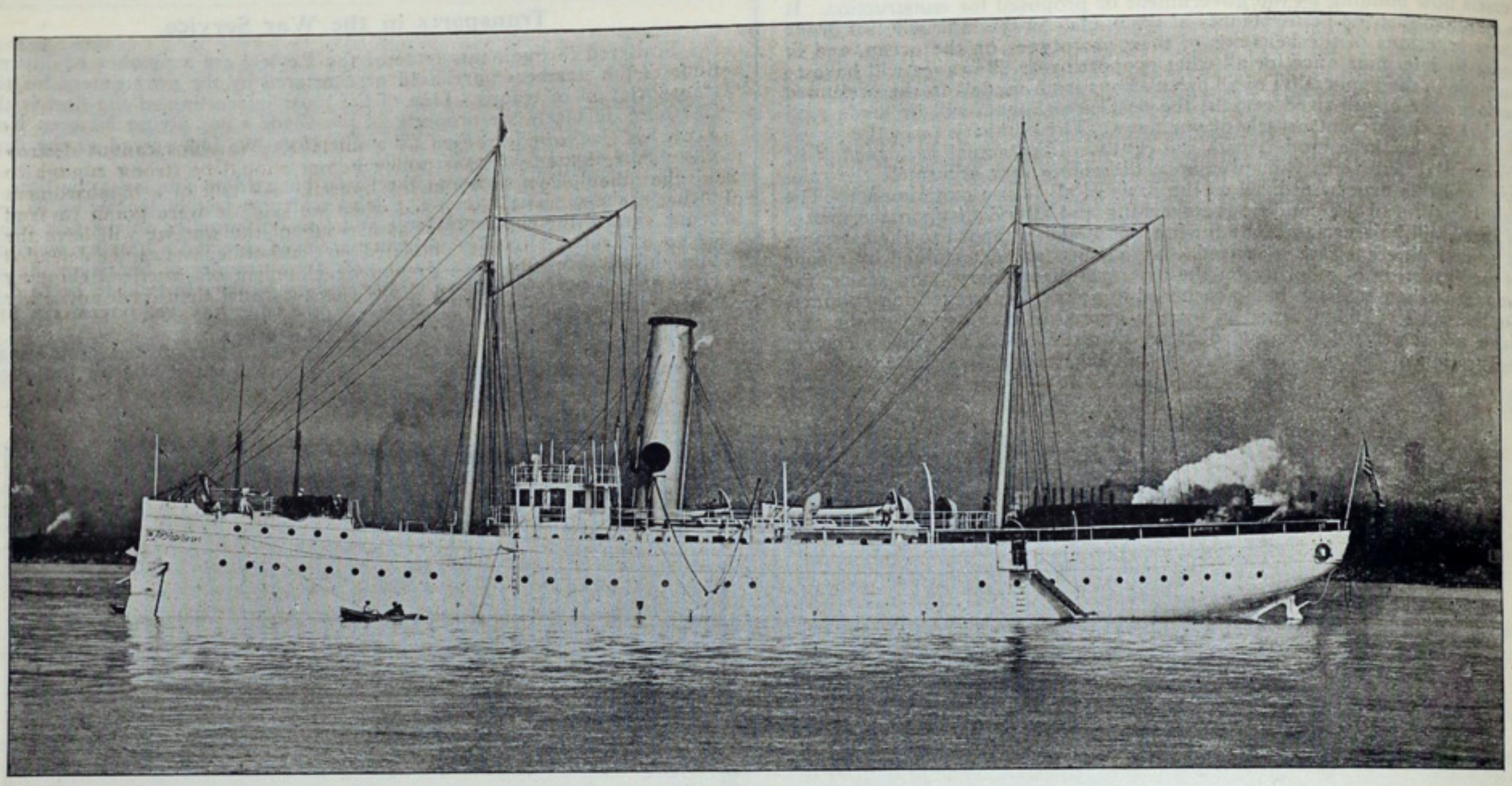
The Plant Line steamers have been but seldom idle since the time of their purchase. The Olivette, a trim craft 290 feet in length by 35 feet beam, carried the correspondents and hospital supplies on the first expedition to Cuba. Probably no transport ever received a heartier welcome than did the Olivette when, soon after the surrender of Santiago, she arrived at that port with upwards of a million dollars in gold to be paid to the soldiers. La Grande Duchesse of the same line was one of the first transports to sail with soldiers for Porto Rico.

Vessels available for transport service were scarce on the Pacific coast at the time the government was straining every nerve to send reinforcements to Admiral Dewey, and the Pacific Mail Steamship Co. turned over almost its entire fleet, including the steamers City of Peking, City of Sydney, China, Colon, City of Para, Newport, Peru and City of Rio de Janeiro. As will be seen from a group illustration of these ships, they are all large, handsome vessels. Especial interest will attach to the picture of the Newport. The photo was taken as the transport was leaving San Francisco for Manila, and the efforts of the soldiers to catch the last glimpse of America are very apparent.

Cruiser Dixie, Formerly Morgan Liner El Rio.

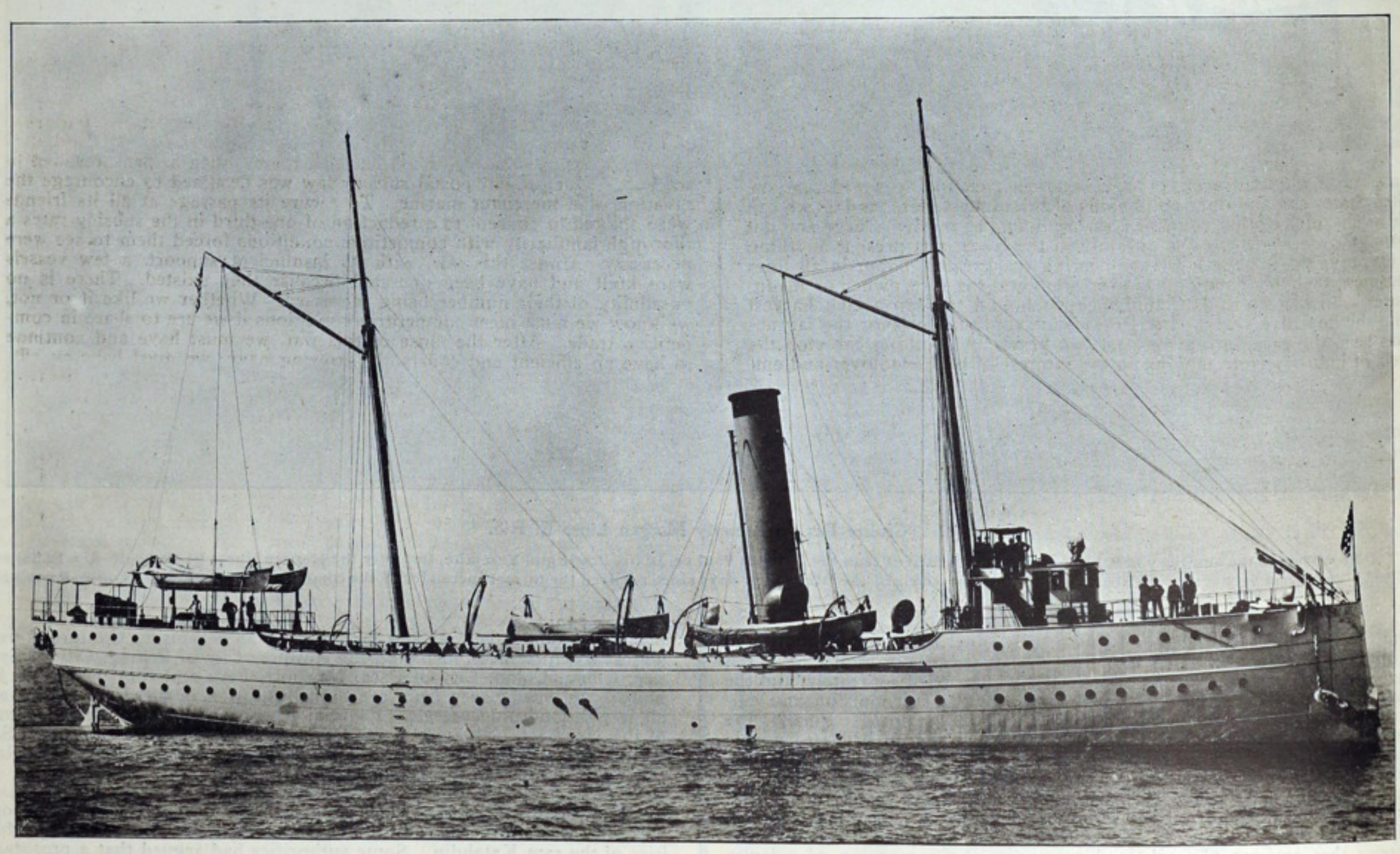
No vessels in the auxiliary fleet have proven more efficient than the cruisers Yankee, Dixie, Prarie and Yosemite, formerly the Morgan liners El Norte, El Rio, El Sol and El Sud. They were very active in Cuban waters, and Capt. Davis of the Dixie a few days since received the formal surrender of the commander of the town of Ponce, Porto Rico.

Many naval experts abroad are greviously disappointed that no opportunity was afforded during the war for a demonstration of the capabilities of the ram Katahdin. Some authorities had argued that a prototype of the Katahdin, but of greater size, increased speed and coal capacity would be the ideal type of modern battleship, and they were anxious to have their theories confirmed or refuted. Commander Geo. F. F. Wild, late naval secretary of the United States light-house board, is in command of the Katahdin.



Revenue Cutter Gresham, Built by the Globe Iron Works Co., Cleveland.

FOR DESCRIPTION SEE PAGE 31.



Revenue Cutter Algonquin, Built by the Globe Iron Works Co., Cleveland.

FOR DESCRIPTION SEE PAGE 31.

NAVY AND MERCHANT MARINE.

MEN PROMINENTLY IDENTIFIED WITH SHIPPING FAVOR THE REVIEW WITH OPINIONS RELATIVE TO THE EFFECT OF THE WAR ON COMMERCE OF THE UNITED STATES.

The Review a few days ago asked from several gentlemen whose position is such as to make any statement from them of interest. an expression of opinion on the subject of the probable effect of the war and its influences upon the American navy and merchant marine. The replies were as follows:

FROM SENATOR WM. P. FRYE.

Editor Marine Review:—"What will be the influence of this war on our merchant marine and our export trade?" is your inquiry, to which you solicit a reply "in a few words." With this limitation, no satisfactory response can be made; nothing more than a few suggestions. This republic has been born again, and all Europe is witness to its birth. China will not now be dismembered, its commerce appropriated without asking our consent, nor will all the islands of the seas be distributed without our country receiving what seems to be required for our commercial ventures. By an act of congress, Porto Rico and the Hawaiian islands will be included within our "coastwise trade," in which no foreign ships can participate; Cuba also, if at any time hereafter annexation shall take place. The war has also demonstrated the necessity of the Nicaragua canal, and its construction will not much longer be postponed. This will bring New York 10,000 miles nearer San Francisco, the Columbian river and Puget sound than now, and bring to our markets the lumber, wheat and other products of the great northwest at about one-half the present cost in time and freight rates. These conditions will enormously increase our coastwise trade and fleet, while the canal must inevitably have a like effect on our exports and on the growth of our marine in the foreign carrying trade, if congress is wise enough to give the requisite encouragement. Today, by means of the Suez canal, Liverpool is, on the average, from 2,000 to 3,000 miles nearer to the five hundred millions of the peoples of the Orient than is New York, and Great Britain's commerce there has responded to this advantage. The Nicaragua canal will deprive her of it and give it to us, bringing New York nearer to this magnificent market than Liverpool and must greatly increase our exports. The subject is by no means exhausted, but the time allowed by you is.

State of Maine. WM. P. FRYE.

FROM THE MANAGER OF THE DETROIT DRY DOCK CO.

Editor Marine Review:—I admire the president's attitude in the war from start to finish. I believe that we should be patient and forebearing with the Cubans. They have had little chance to gain much knowledge about self-government but will soon learn, for the republic is bound to be in evidence in Cuba. I look for a rapid development of the resources of Cuba and Porto Rico and a continuation of the boom in foreign trade which we have experienced during the past year. The friendly expressions of British statesmen and the press regarding our position in this war will encourage her people to trade more exclusively with us, and a reciprocal spirit on our part is all that is needed to lead to a largely increased volume of trade. The enlargement of the St. Lawrence canals to the dimensions of the Welland canal is going to enable us to deliver our provisions abroad at prices to beat the world. The repeal of that portion of our treaty that prevents the building of war vessels on the lakes will doubtless soon be accomplished, by reason of the fact that the large appropriations likely to be made for increasing our navy will lead to lake ship yards securing a large share of government work in the line of torpedo boats, dispatch boats, revenue cutters, etc.

The performances of the Columbia and Oregon, and indeed the performances of our entire navy, have demonstrated to the world that the United States can and does build ships of the highest class, and as we can build as cheaply as other countries, we are bound to receive a large amount of foreign orders. While the outlook on the lakes is at present anything but encouraging, I believe we are nearing the greatest boom in all lines of business that this country has ever seen, and the ship owner or manufacturer who has up-to-date appliances is bound to reap a rich harvest within the next five years. Let Providence continue to favor the farmer, as has been the case during the past two years, and nothing can stop the wheels of industry from moving in the interest of both employer and employed. A. McVITTIE.

Detroit, Aug. 9, 1898.

FROM THE PRESIDENT OF THE LAKE CARRIERS ASSOCIATION.

Editor Marine Review:—I am afraid my opinion, owing to a lack of knowledge of conditions ruling in our foreign trade, will not be worthy of much attention. So far as I can see, the results of the war will make little difference with lake business, except so far as it increases the demand for steel and iron in the building of a new navy, the extension of commerce in American bottoms, and the opening of new markets. Perhaps this will be overcome by the increased imports of Cuban iron ore. For one I am firmly convinced that the island of Cuba will become a part of the United States in the natural working out of commercial and industrial conditions. The island will be developed from its present state of ruin by American and English capital, and the influence of this capital for the retention of the island under American rule will be too strong to be resisted. If this be true, the iron ore mines around Santiago will compete on equal footing with our Lake Superior region, and the cost of production and transportation will be reduced on Cuban ore the same as it has been on Lake Superior ore.

The immense coastwise traffic certain to be developed between Cuba, Porto Rico and the United States will require a large fleet in itself, and this will give a great impetus to ocean ship building. In the case of the Philippines, I presume American vessels would be given no advantage over foreign bottoms, even if we take those possessions. Our policy will be doubtless to show the utmost impartiality towards all nations.

As to general ocean trade, I know so little that I will not venture any views. I presume subsidies will be granted more freely, particularly to South American countries. A vast increase in our export trade to Cuba and Porto Rico will, of course, follow the war. So far as flour and provisions go, we will have these markets to ourselves, simply because we can sell cheaper than any other nation. In short, I expect Havana to become an English-speaking city in its business life within ten years.

Nothing can now stop the upbuilding of a navy second only to that of Great Britain. Any party that stands in the way will be brushed aside. What we want are ships that can fight, no mere defense vessels. The building of monitors I regard as a mistake. Warships cannot destroy modern shore batteries. Our policy in war should be strong enough to make the other fellow look out for himself. All talk of a bombardment of American seacoast cities ended when we said we were going to send Watson across to Spain. Then as a result of the war we will have the Nicaragua canal and have it completed, so that both coasts can be defended by an overpowering fleet. A greater development of American shipping will come from the opening of the Nicaragua canal than from any other result of the war. J. S. DUNHAM.

Chicago, Aug. 5, 1898.

FROM THE PRESIDENT OF THE CHICAGO SHIP BUILDING CO.

Editor Marine Review:—I believe our country is entering into an era of export business far beyond the average expectation. To aid in making this effective, an increase in our navy is absolutely necessary, as this will serve to protect us in all of the markets of the world, and as a result would naturally tend towards a large increase in our merchant marine. I am satisfied we can build ships in competition with every foreign builder, and if the outcome of the war has no other lesson, its effect will, I believe, be to build up both our naval and merchant marine. I hope and expect to see Porto Rico a province of our country, Cuba practically under our control, and sufficient coaling stations on the Pacific to enable us to hold our position in a proper way for the far eastern trade.

Chicago, Aug. 2, 1898. W. L. BROWN.

FROM MR. FRANK J. FIRTH OF PHILADELPHIA.

Editor Marine Review:—The conditions that are to follow the close of the war no man can foresee. It is already evident that the most difficult problems the war will present are those to be dealt with after its close. The general sentiment of the country appears to indicate that, in addition to the Sandwich islands, we will have added to our possessions all of the Spanish West Indies islands, including Cuba, with more or less of the Ladrones and Philippine islands. Coaling stations on the latter group appear to fulfill present conservative requirements. This means a strong and efficient navy, kept up to the latest modern standards; a naval policy resembling that of England. Such a policy, with its constant and growing expenditure, has been made possible by the victories of Manila and Santiago. Our people—all of our people—now know what a navy means, and each true American citizen feels a personal pride and share in these naval triumphs that have so startled the entire world. The new navy that will be necessary to protect our colonial interests, no good citizen will fail to commend, and—pay taxes for. This navy must have a further useful mission to command a continued popular support. It must protect a vigorous and healthy merchant marine, making our flag known and respected in all the markets of the world. Without a merchant marine, the navy will soon lose its claim upon the sympathy of the tax-payers, and it will be without the support of the fleet of transports and trained sailors that our present experience has proved are essential to naval success. The recent marvelous victories, with their even more marvelous freedom from loss of life, will attract the young men of our country to the sea, and our nation may again resume its old-time supremacy on the oceans. We should have, we must have, a merchant marine. We never will have an ocean merchant marine,however, as the result of individual effort unsupported by the national government. Nor will we have an efficient merchant marine under any illiberal national policy, such as has prevailed in the past. Our present postal subsidy law was designed to encourage the creation of a merchant marine. To secure its passage at all its friends were obliged to consent to a reduction of one-third in the subsidy rates a thorough familiarity with competitive conditions forced them to see were necessary. Under this law, with its insufficient support, a few vessels were built and have been operated because they existed. There is no possibility of their number being increased. Whether we like it or not, we know we must meet competitive conditions if we are to share in competitive trade. After the close of this war, we must have and continue to have an efficient and constantly growing navy; we must have an efficient and constantly growing merchant marine on the oceans, liberally supported by the nation through such subsidies, bounties or other legislative methods as the necessities of competition with other nations may demand; we must have our own ship yards to create and maintain our naval and merchant marine, so that we shall not depend upon any foreign country for our national life, and therefore we should not give our flag, register or controlled trade to any vessels not built in our own country. The nation should unite in demanding from our national legislature a navy, a merchant marine, and home ship yards.

Philadelphia, Aug. 5, 1898. FRANK J. FIRTH.

FROM A LAKE VESSEL OWNER.

Editor Marine Review:—I believe the "Spanish war" has been justified already in the results achieved by us and by the possibilities now apparent under our new departure for future benefit along many lines. Our government tried to prevent the war. It entered upon its consideration with hesitation and reluctance, but finally yielded to the clamor of the dominant American sentiment for humanitarian interference. Out of the wreck of conflict, in a material sense, we have saved Cuba, Porto Rico, the Ladrones and probably the Philippines—a good real estate transaction. Hawaii was thrown at us, and we caught her. We probably would have muffed her, purposely, except for Dewey's victory at the Philippines. We tossed aside our Monroe doctrine, entered upon a policy of territorial expansion, and now regarded the acquisition of Hawaii as paramount. The brilliant victories of our navy evoked the admiration of the world, and we suddenly rose to a high place in the constellation of great powers. Our flag, though seldom seen on the high seas, at once acquired dignity as something to respect and fear. England began to speak kindly of us and even suggested an alliance of the two great Anglo-Saxon powers. This tickled our pride and coincided in a large sense with our inclination.

Patriotism rose to high tide, and our people, north and south, for the first time in forty years, became as one man.

Above are some of the accrued benefits of the war. Prospectively, there are others. Americans with capital will flock to Cuba and Porto Rico and establish industries. The natives will be elevated, increasing their wants and their means to gratify them. Imagine, if you can, the increase of our business with these islands alone. Then under our new regimé of expansion and more aggressive foreign policy, being in closer touch with all nations, our export trade should largely increase, if the conditions hereinafter named are made favorable. It should also aid in developing our merchant marine and will do so to some extent.

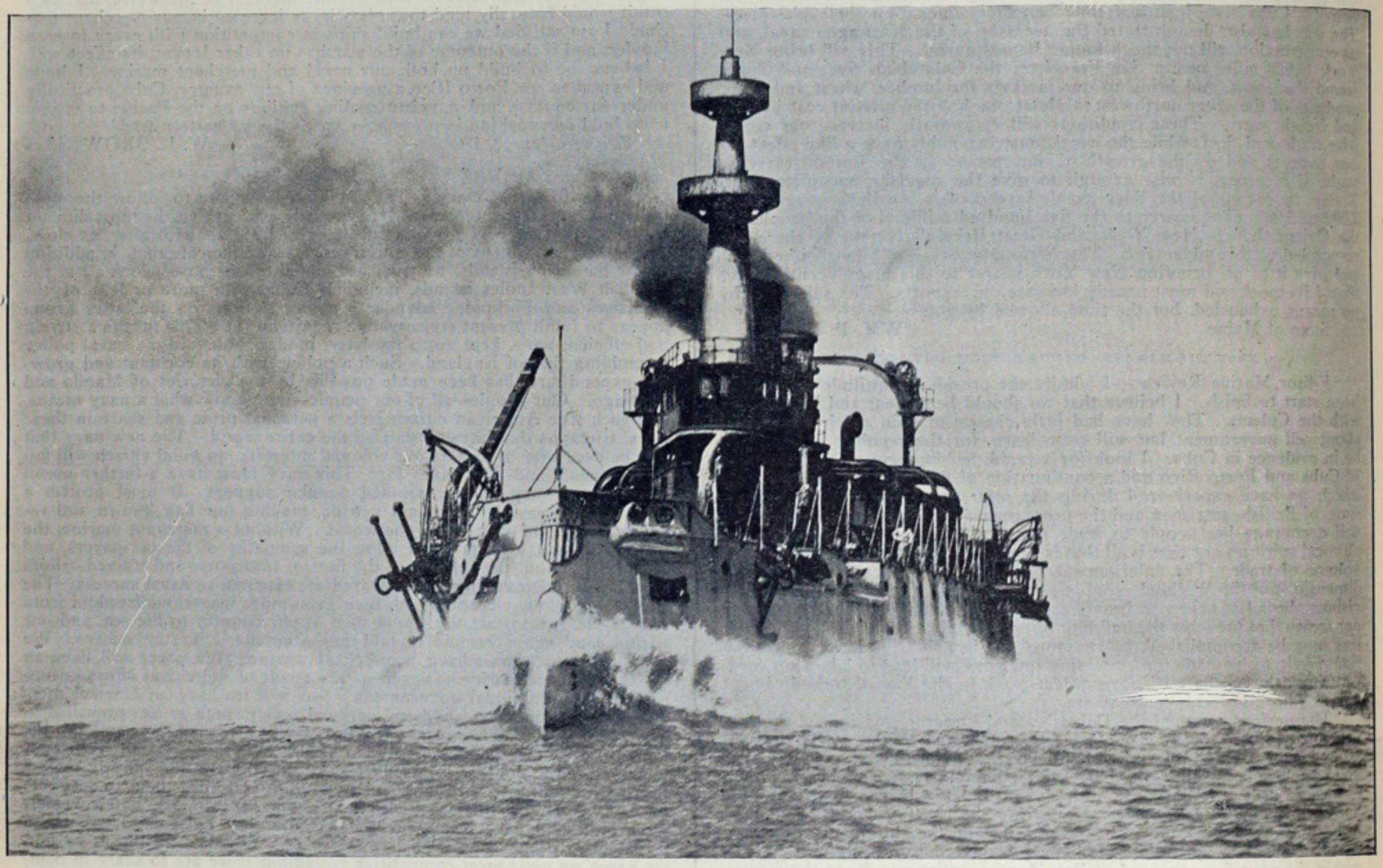
In prosperous years for ocean tonnage our vessels, the few we have left, can hold their own, but in dull times, which are the rule, we cannot compete with the tonnage of England and other nations. Our merchants are patriotic and prefer to ship in American bottoms, but competition with foreign merchants is sharp when selling goods in the world's markets, and tonnage must be employed at the lowest rates. Our labor employed in building our ships and providing their crews is much higher than that of England and most foreign maritime nations. The foreigner underbids us and secures the business, while our ships are driven into our coasting trade, whither the vessels of our great "Anglo-Saxon ally" can not intrude. Let us hope that our increased trade with the Greater Antilles and abroad, as a result of the war, may set the drift in the other direction.

But it is my positive conviction that our export trade cannot assume very large proportions until we can manufacture goods as cheap as can be done abroad. Our higher-priced labor handicaps, and we are disinclined to reduce it. But cheaper labor means cheaper goods and larger sales, and larger sales compel greater production, while this in turn multiplies jobs for the laborer. In the end the laborer is benefited by steady work, even if at reduced wages, which is better than working only half the time at present wages. But God forbid that we should ever be compelled to reduce our labor to the cost of foreign pauper labor. In view of our mammoth manufacturing plants, with their improved labor-saving machinery, such large reduction will not be necessary to enable us to produce as cheaply as our foreign competitors.

Under our new departure we shall be obliged to maintain a large army and navy. This will furnish employment to a large per cent. of our idle population. Then it will conserve peace, since it is the habit of the great powers to pounce upon the weaker nations. I have sought to show that this war, with our initial action for humanity's sake, "ran away with us" and led us, unwittingly, to a fruition and vision of unimagined benefits. "We builded better than we knew." There was "a Divinity which shaped our ends."

B. L. PENNINGTON.

Cleveland, Aug. 6, 1898.



Battleship Oregon, the Pride of the Pacific, at Full Speed—Built by the Union Iron Works, San Francisco.

Aggressive Policy for the Navy.

Every man in the navy, as well as that portion of the general public—and it is now a pretty large one—which takes an interest in its welfare, will agree heartily with the contention of the war board, that our auxiliary naval fleet ought not to be too rapidly reduced, and with its advocacy for a thoroughly up-to-date and aggressive policy for the navy from this time forward. The time is ripe for just such a policy, indeed it is extremely improbable that anything less will be acceptable. There never has been a time in the history of the United States when the navy meant more to its officers and men than it does today, or when they were so willing to work actively and as one man for its upbuilding and extension. Better still, the great American public bids fair to within a very short time stand where the British public stands today in the display of that broad patriotic spirit that begrudges no expenditure so long as it means the development of the navy. Moreover, the sentiment is not, from the very best evidence presented, a wartime fad or a passing enthusiasm. The men who are foremost in its advocacy are the solid, sensible but wide-awake citizens, the men who can be counted on not to be carried along by every visionary scheme. It is simply a case where the American taxpayer wants a first-class navy and where he is willing to pay for it.

According to newspaper dispatches, the war board visited the white house one day this week in the hope of impressing the president with the desirability of retaining the auxiliary fleet. Their argument is that the vessels will be required for police and customs duty in the West Indies and on the Pacific. It is doubtful, however, if on this particular point the plan of Secretary Long is not best. He seems to agree with the general outline of the plan of the war board, but he wishes to dispense as soon as possible with the converted yachts and chartered vessels, a seemingly very wise provision. The secretary, however, has another project up his sleeve that does not commend itself. If reports be true, he desires to enter into negotiations abroad for the purchase of additional cruisers as soon as the neutrality restrictions are removed. This would appear to be needless and inadvised. Everybody at all conversant with the subject will admit that our navy needs to be strengthened by the addition of cruisers, particularly of the armored type, but we can build better ships here at home and build them cheaper in the immediate future than they can be built in European yards. There need be no fear, moreover, regarding the expeditiousness with which the vessels could be turned out. Given the orders, our ship builders will attend to that and attend to it satisfactorily. Certainly it would be highly incongruous for this country, while her ship builders are constructing warships for foreign powers, to be placed in the position of going abroad for its own fighting vessels.

A decision under consideration by the navy department which would impress many people as a wise one, would be the re-establishment of a European station. The move need not be characterized by the suggestion of a boastful spirit, but simply as the to-be-expected evidence of the assumption by the United States of a new place among the powers, which she is in future to hold. It is doubtful if, with the possible exception of our representation at the Paris expositon anything could reap for this country more benefits of the right kind than the dispatch to European waters, as soon as they are released from war duty, of a couple of our battleships and one or two of our best cruisers. There was, of course, a semblance of a European squadron before the war, but it now needs to have permanency and be stronger than ever before.

Lidgerwood Electric Hoist.

The electric hoist illustrated herewith is of a kind made by the Lidgerwood Mnfg. Co., No. 96 Liberty street, New York, which company is also building the entire equipment of winches for the battleships Kearsarge and Kentucky, extensively described in this issue of the Review. Hoists for these battleships are to be operated by electricity, and are made from especially prepared designs. The Lidgerwood company also equipped the cruiser Chicago with ammunition hoists, which will be operated by electricity. There is a constantly increasing demand for electric hoisting machinery aboard steamships and on docks for loading and discharging cargo, handling ammunition and other deck and general hoisting purposes. The illustration shows the latest type of electric hoist built by the Lidgerwood company for this kind of work.

This hoist is simple, light and compact in its construction, and efficient, quick-acting and economical in operation, and designed for hoisting loads from 1,000 to 6,000 pounds at a speed of from 150 to 600 feet per minute. It is equipped with a General Electric motor of the direct-current type, wound for 110 to 500 volts, and of a style adapted to give the best results. The drum is of the Lidgerwood standard friction type with band brake, and is brought into frictional contact by means of the upright hand lever shown in quadrant. The brake is operated by a foot lever, but if preferred can be operated by the same kind of a lever as the friction drum, and placed alongside of it. Any man of ordinary intelligence can run the machine complete. The control is secured by the ordinary form of railroad controller, which is securely attached to the bed plate and ordinarily with five speeds. The reversing lever is also shown on the top of the controller, and the mechanism is so arranged that the reversing cannot take place until the current is shut off, being entirely automatic in its action.

The motor is inclosed in a cast steel casting, which is water and dust-proof. The commutator is accessible for inspection or for renewal of the carbon brushes, by means of a hinged door. The resistance boxes are mounted inside in the bed plate of the machine out of sight, and are of special design and of great efficiency and long life. The hoist is furnished with compound gear, the motor gear being inclosed in an oil-tight case. The drum gear is cast from accurate iron patterns and is virtually noiseless when running; indeed, this, with the ability to stand over loads, is the most striking feature of the Lidgerwood electric hoist. Built on the interchangeable part system there is no delay in securing duplicate parts when repairs are necessary. For dock and other work, about warehouses, coal yards and ship yards, where it is convenient to lay steam or air pipes, the electric hoist is especially well adapted, as the wires do not occupy any appreciable space and the current can, of course, be conveyed any distance.

Improved Outlook for Lake Trade.

Iron ore shipments from all Lake Superior ports on August 1 aggregated 6,818,887 gross tons, against 5,415,560 tons on the same date in 1897, or a gain of 1,403,327 tons. These figures are from reports furnished by dock superintendents at all ore shipping ports. As had been expected, there was a falling off in July from the enormous movement that has characterized the ore business since the opening of navigation. Stock piles were moved from the mines earlier than usual this spring and a scarcity of labor in the Lake Superior region has also affected the July output. Then, too, it must be remembered that in July, 1897, vessels in the ore trade were nearly all running up the lakes light, on account of the great scarcity of coal. The decrease in July of this year as compared with July, 1897, is 58,567 tons. It will be noted by the following summary of shipments to Aug. 1, 1897, and 1898, that the gain this year is due almost entirely to the heavy movement in April and May, following an early opening of navigation:

	1898.	1897.
Shipments to June 1	2,334,039	1,105,637
Shipments during June	2,278,144	2,044,652
Shipments during July	2,206,704	2,265,271
Total	6,818,887	5,415,560

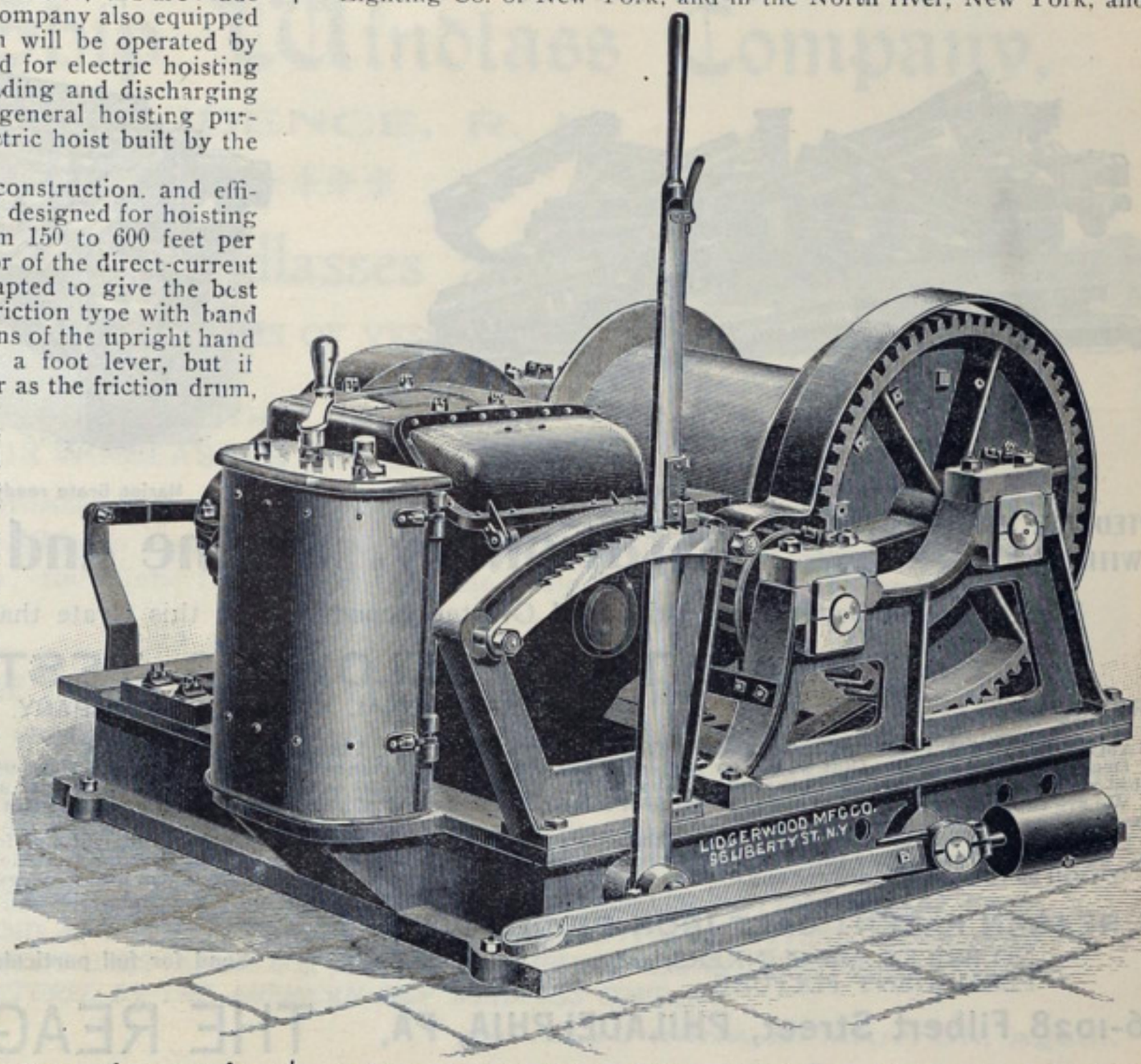
Duluth is the only ore shipping port at which there is no gain over last year's shipments to Aug. 1. The output from Minnesota mines shipping through Duluth is just equal to that of a year ago. Duluth shipments are principally those of the Carnegie-Oliver interests. At Two Harbors there is a gain of 140,000 tons, and there is an increase also in the Escanaba shipments, but the largest gains are from Ashland and Marquette.

Vessel men are disposed to look upon this summary of ore shipments as decidedly favorable from their point of view. Their argument is to the effect that the increase of 1,400,000 tons for the season thus far is not all that will be required in 1898, in view of the very heavy consumption in all iron and steel lines, and that the July loss of about 60,000 tons cannot be made up without a strong lake freight market, if the movement of grain and coal keeps up to anything like the present volume.

The new whaleback steamer Alexander McDougall, recently completed by the American Steel Barge Co. of West Superior, effectually smashed all whaleback records this week, bringing down on her initial trip, from Duluth to Cleveland, a cargo of 7,319 net tons of ore on a draught of 17 feet 10 inches aft and 17 feet 8 inches forward. The trip was satisfactory, although there was no attempt to speed the vessel, as the engines were not, of course, in shape. On the vessel on the trip down were Mr. Albert C. Diericx of the American Steel Barge Co., Mr. Waltz of West Superior, Chief Engineer Arnold, Vice-President W. D. Hoxie of the Babcock & Wilcox Boiler Co., and Messrs. Dalton and Coulby of Pickands, Mather & Co. Capt. Kilby, who was in command of the Rockefeller last year, is master of the McDougall, and Irwin Marshall is chief engineer.

Bells on Gas Buoys—Gas Beacons.

The gas buoy, most favored of all the aids to navigation on the great lakes, is soon to perform another service that will make it more popular than ever. For some time past experiments with a bell attachment to this buoy have been under way at the works of the Safety Car Heating & Lighting Co. of New York, and in the North river, New York, and now



the light-house officials at Tompkinsville are to investigate the merits of the device. Officials of the Safety Car Heating & Lighting Co., controlling patents on the buoy in this country, are fully confident that the bell device, which is to be operated by gas, but with practically no loss in the efficiency of the buoy as a light on this account, will eventually prove as satisfactory as the buoy itself. With this end in view, Mr. Wm. St. John, representing the New York company, recently made a trip around the lakes, visiting the light-house engineers and inspectors of the several districts. He is satisfied also that gas beacons, especially suited to places like Racine reef, the Sault river, and harbors like Duluth and Superior, can be established with profit to the government and with assurance of improved service in the matter of lights at these places. At various points on Lake Michigan, wooden conduits are used for the purpose of drawing lamps with rope attachements to and from pier heads, that are so exposed as to make it impossible to maintain lights by ordinary methods in time of severe weather. Gas beacons on these pier heads would overcome this difficulty and would prove fully as reliable as the gas buoys, which are so generally in favor on account of their reliability. It is proposed to also provide a bell attachment to these gas beacons where required. The bells for beacons could be of full 300 or 400 pounds weight; on the buoys the bells would probably not be of more than 200 pounds, but this is, of course, larger than the bell of the ordinary bell buoy. The gas beacon is not in any way an experiment. There are some forty of them, all of the Pintsch kind, in use on the Suez canal, in addition to forty-two gas buoys. The Safety Car Heating & Lighting Co. has gas plants at Buffalo, Cleveland, Toledo, Detroit and Chicago, and others will undoubtedly be erected when the system of gas lights, beacons and buoys is more fully established on the lakes. Just now the use of more lights of this kind is delayed, on account of the light-house officials on the lakes being poorly supplied with tenders. The war caused several Atlantic coast vessels in the light-house service to be transferred to the navy, and a couple of them that would have been transferred to the lakes are not available for the present. There are now forty gas buoys on the lakes and 106 of them in all throughout the country.

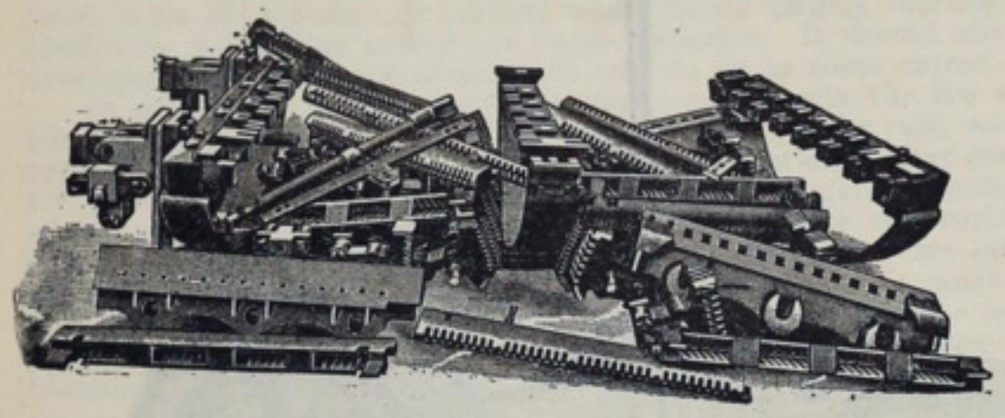
The Revenue Cutter Algonquin.

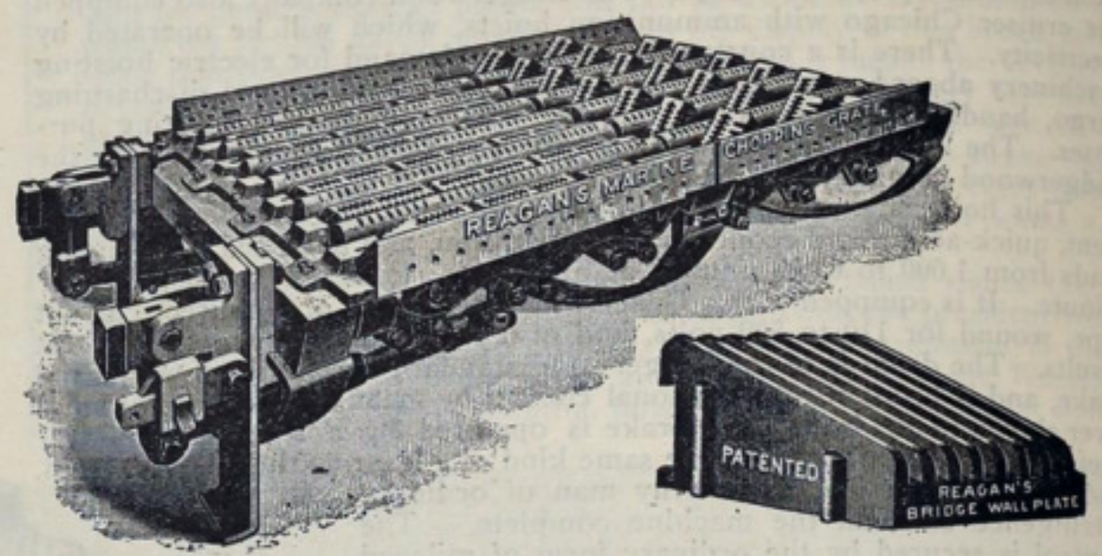
The revenue cutter Algonquin, pictured on another page, is one of the three revenue cutters built by the Globe Iron Works Co. of Cleveland but transferred at the commencement of the war from the treasury to the navy department. The Algonquin is 205 feet over all, 188 feet keel, 32 feet beam, moulded, 17 feet depth, moulded. She has triple expansion engines; cylinders 25, 37½ and 56¼ inches by 30 inches stroke. Four boilers 11½ by 10 feet in size. The Algonquin is very similar to the Gresham shown on the same page, and is the exact counterpart of the Onondaga. The latter two vessels are now on their way through the St. Lawrence canals to the coast. All three have made in excess of 18 knots, and will in all probability be retained by the government for Atlantic coast service.

An advertisement elsewhere in this issue from Capt. Harry Taylor of the United States army engineer corps, Seattle, Wash., announces that bids will be opened at the Seattle engineer office Sept. 5, 1898, for a steel hull tug boat.

The REAGAN DEAD BAR CHOPPING GRATE.

A Perfect Grate in Every Particular.





Marine Grate shown in detail. Marine Grate ready for furnace. Bridge Wall.

ADAPTED FOR USE IN CONNECTION WITH **Stationary, Marine and Locomotive Boilers.**

We Guarantee Better Combustion and Greater Economy with this Grate than any other Grate on the Market.

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AMERICAN LINE. INTERNATIONAL NAVIGATION COMPANY. RED STAR LINE.

Philadelphia, April 17th, 1897.

MR. JAMES REAGAN, President and Manager, The Reagan Grate Bar Co., Philadelphia, Pa., U. S. A.

Dear Sir:—This certifies that we are so well satisfied with the performance of your Patent Grate placed in the furnaces of the S. S. "Pennsylvania" in August last, that we are preparing to extend their use on board other Steamers as fast as the business will permit, or as renewals and replacements are required.

We are thoroughly convinced as to the value of this Grate in the way of admitting of high consumption of coal, in its durability under this increased consumption, and in the efficient burning of the coal.

On the "Pennsylvania" we are burning at the rate of from thirty to thirty-five pounds of coal per foot per hour, and cleaning the fires only once in twelve hours. With the ordinary grate this was found to be impossible, and of course the shaking or moving qualities of your Grate makes this possible.

We will be very glad to answer any queries from possible customers regarding its use if you find it necessary to refer to us.

Yours very truly, JAS. S. DORAN, Superintending Engineer.

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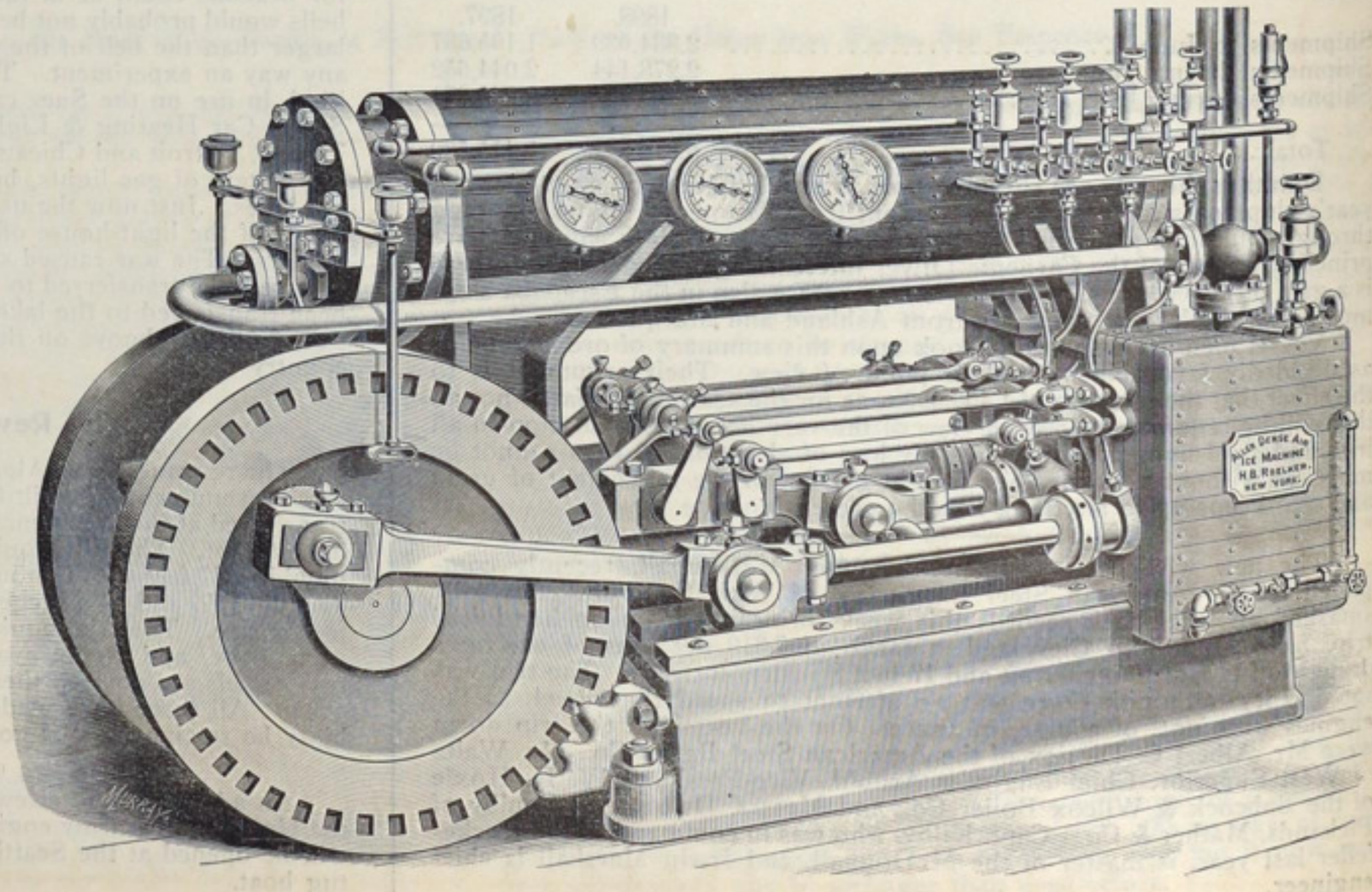

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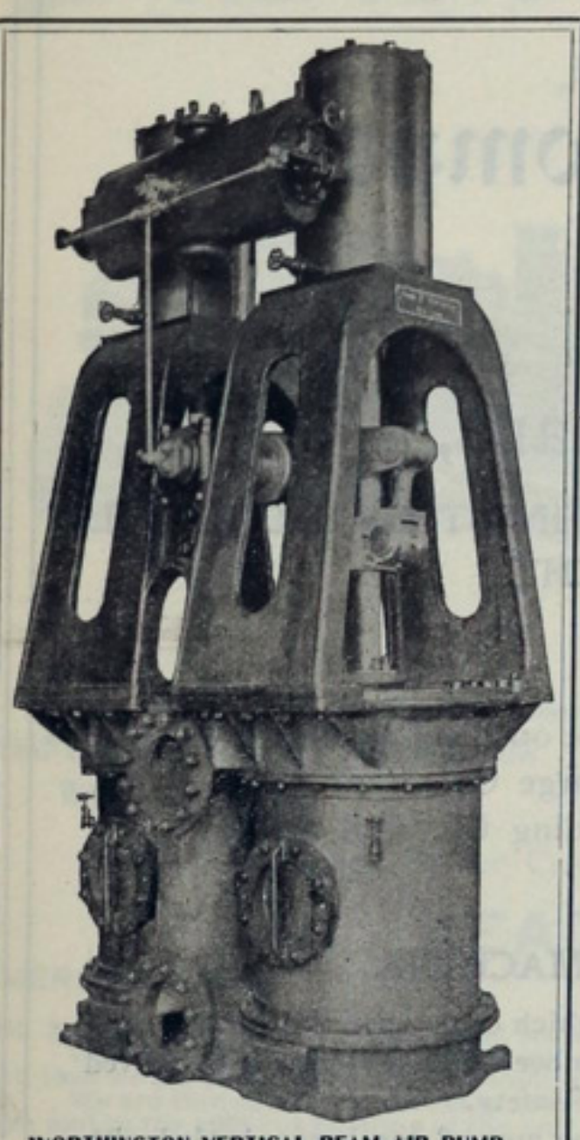

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Don't be Misled

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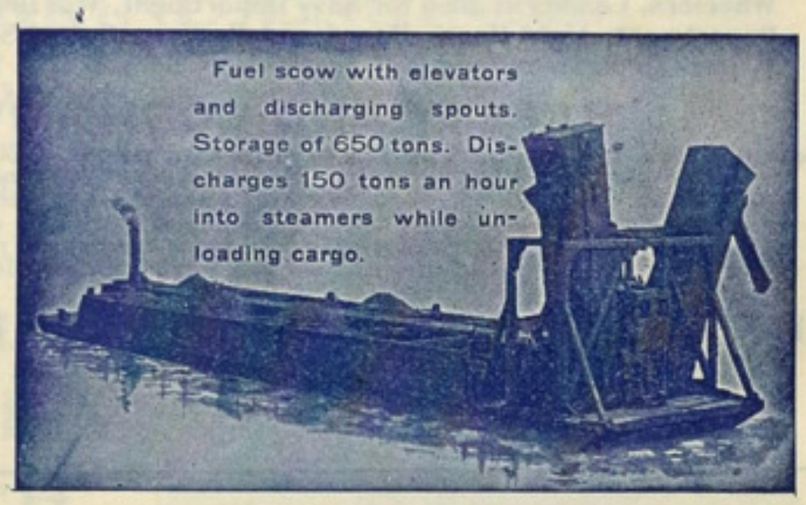

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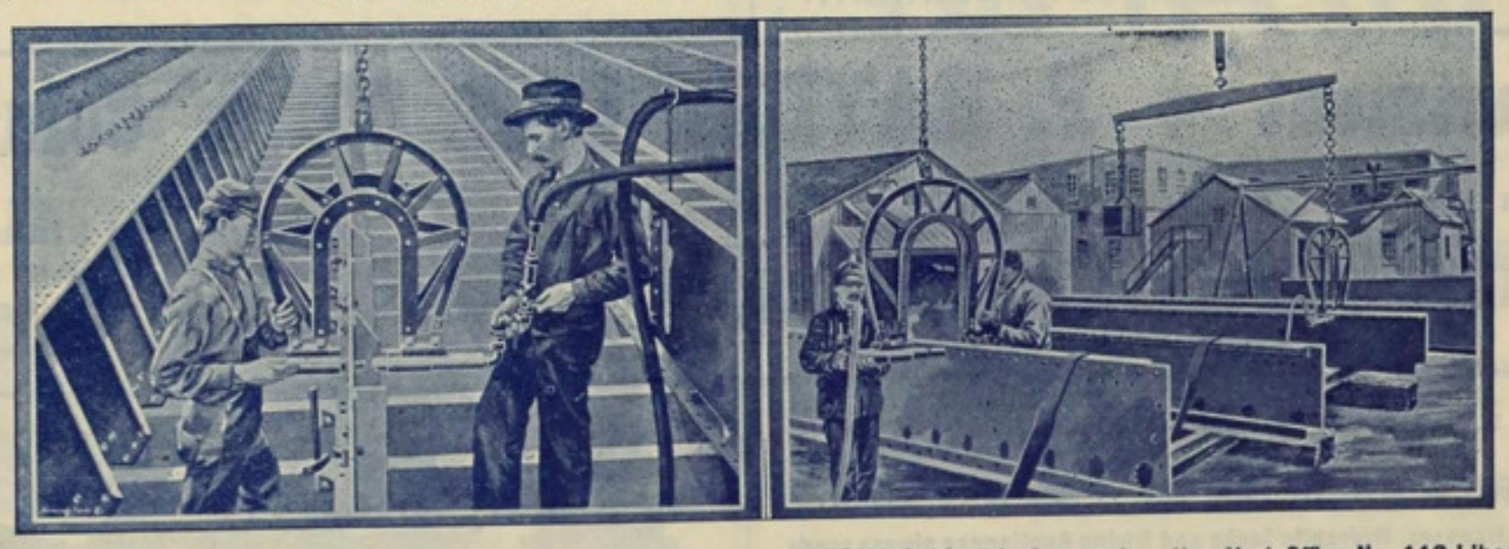

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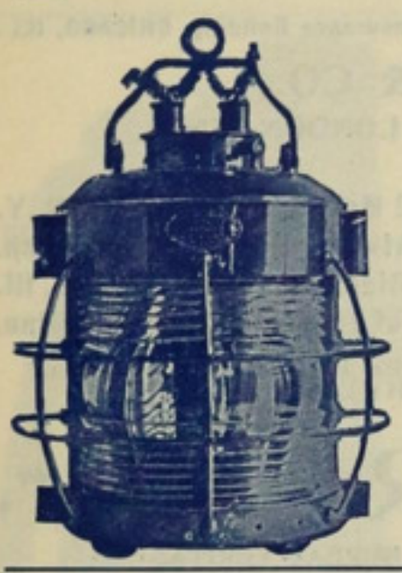

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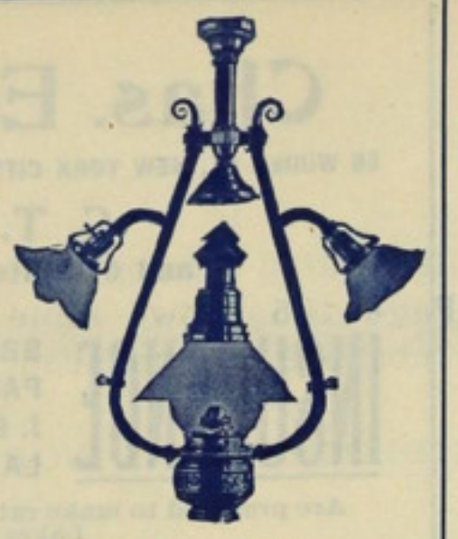

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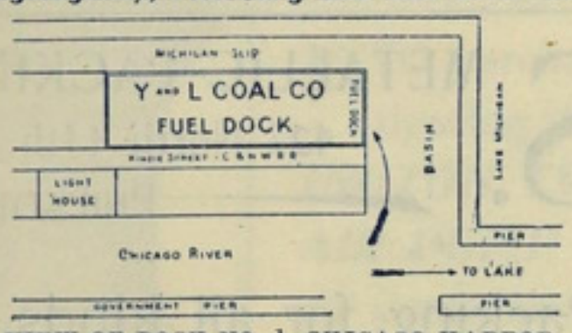

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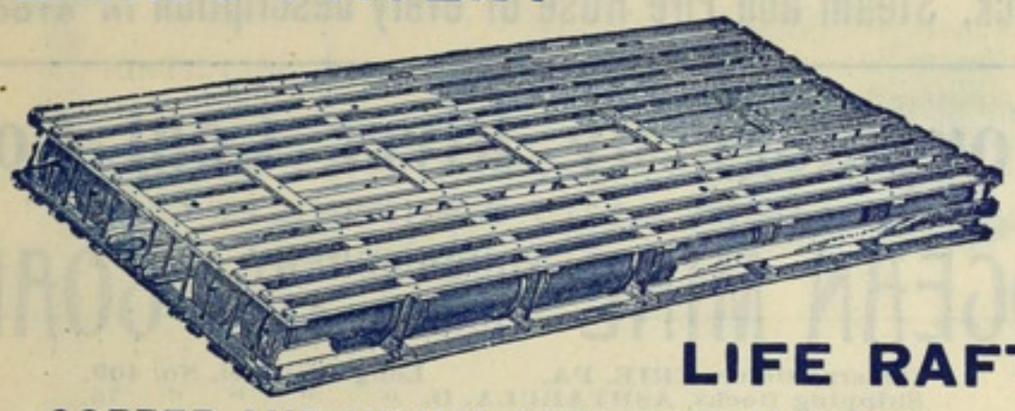

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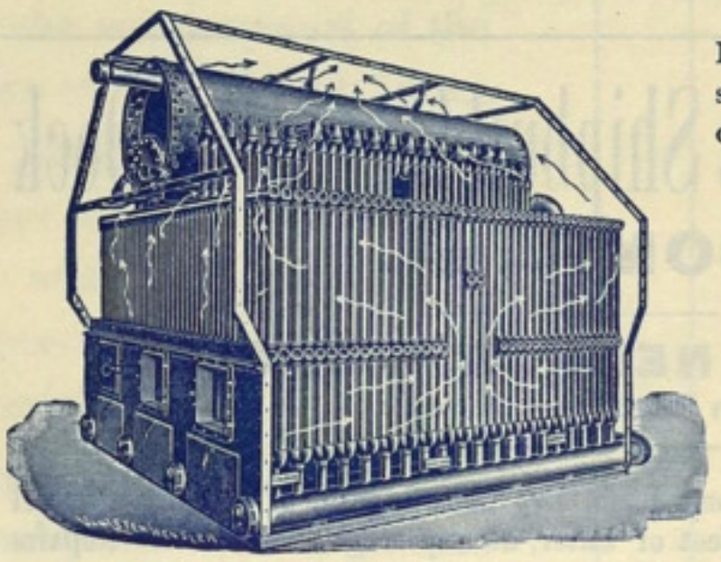

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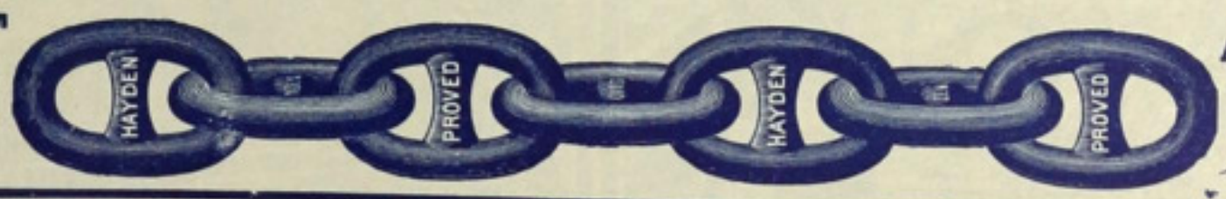

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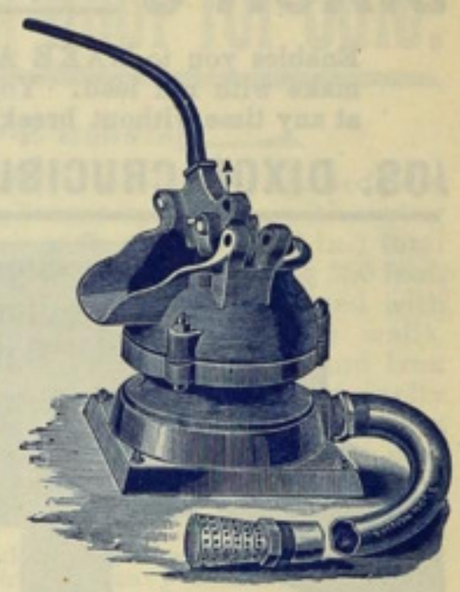

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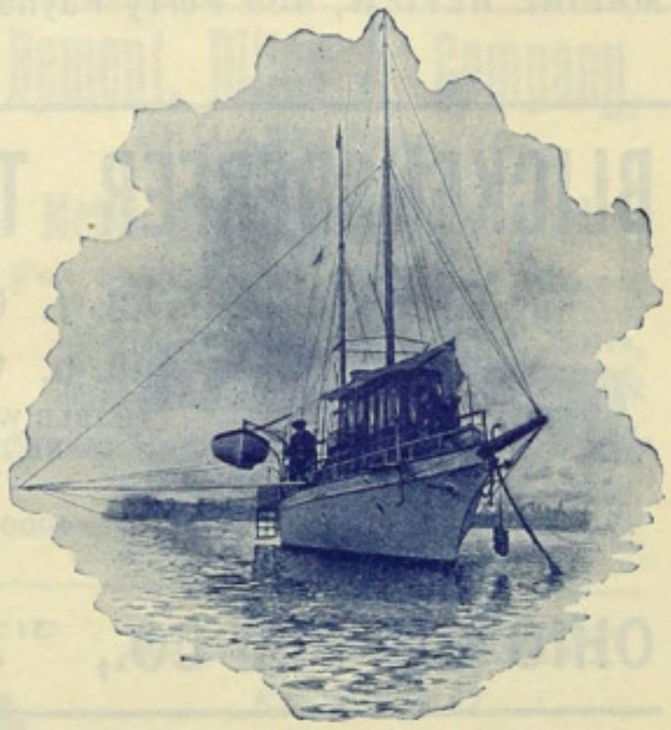

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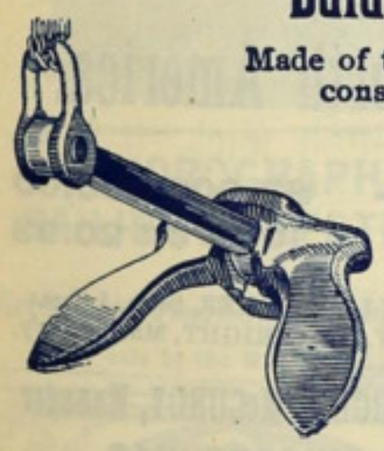

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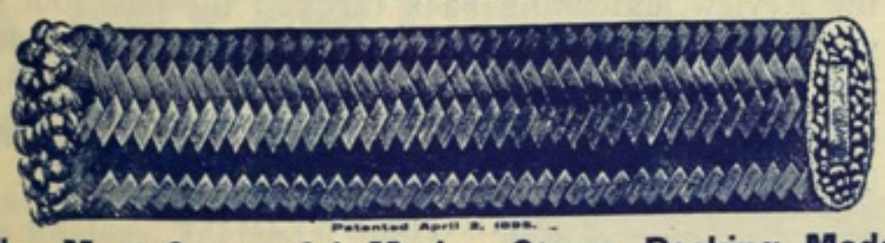

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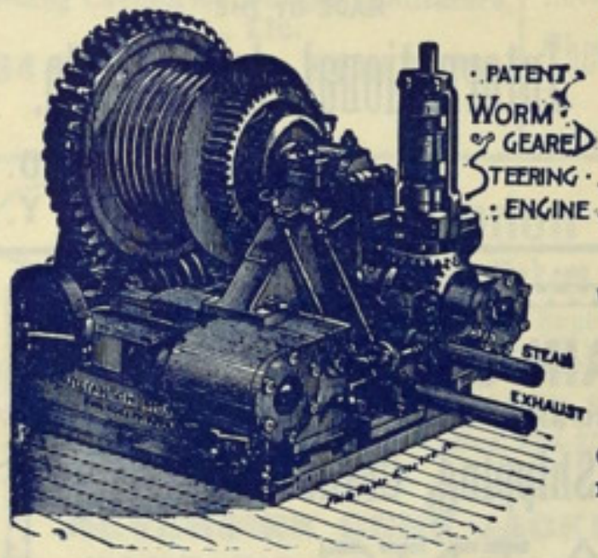

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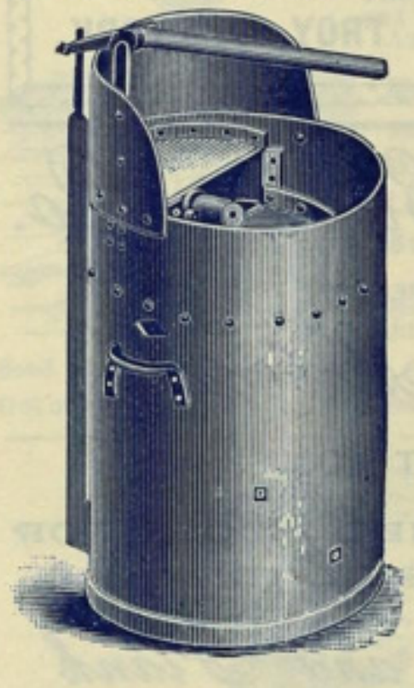

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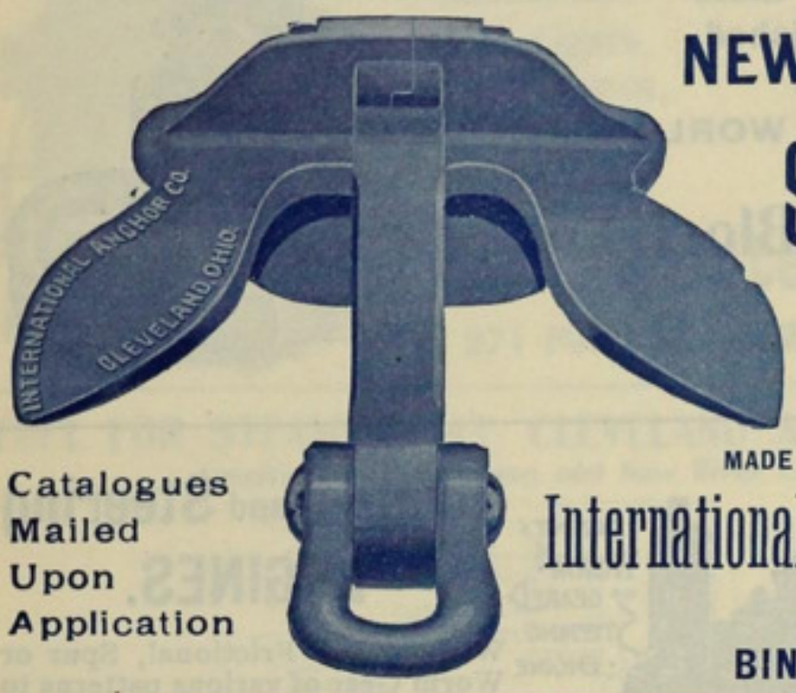

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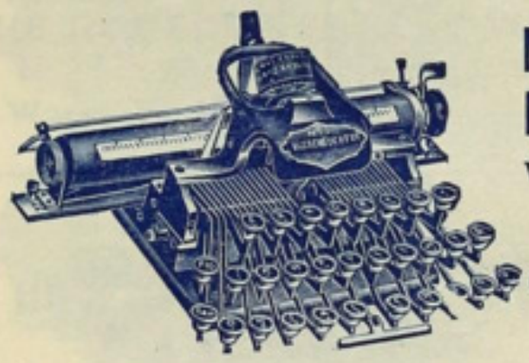

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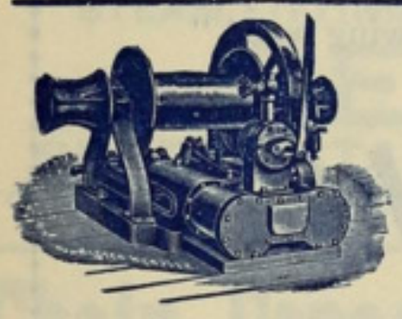

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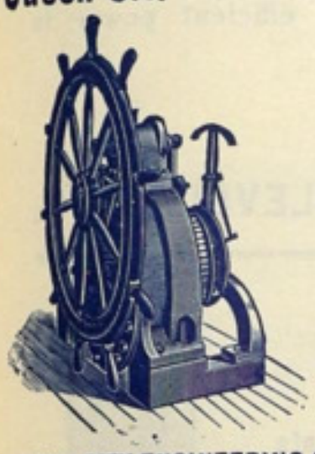

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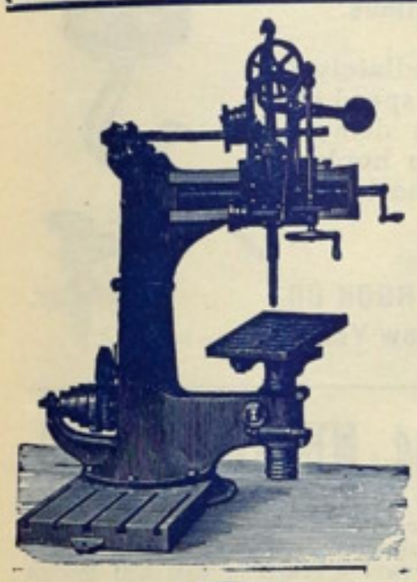

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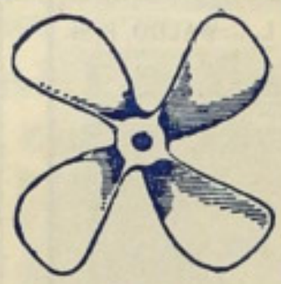

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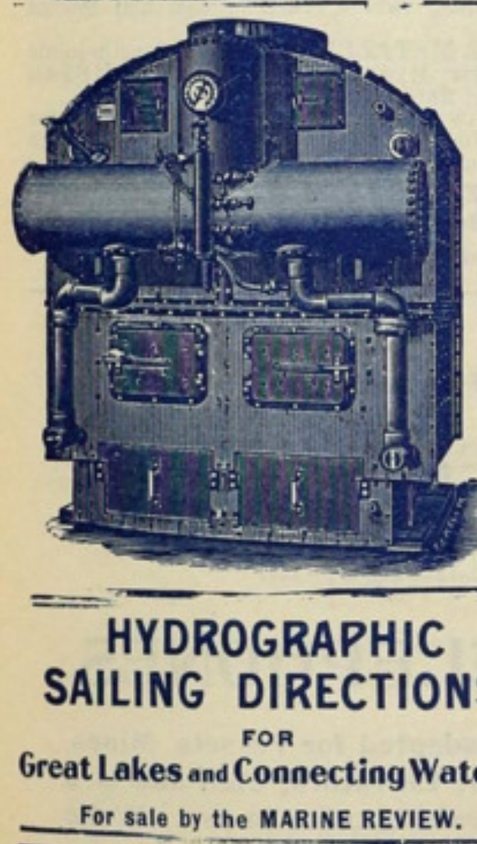

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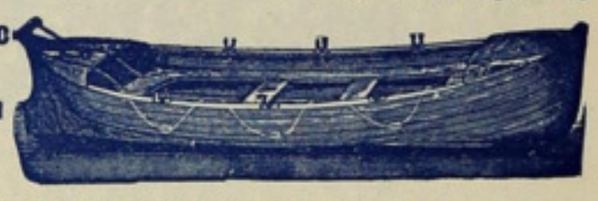

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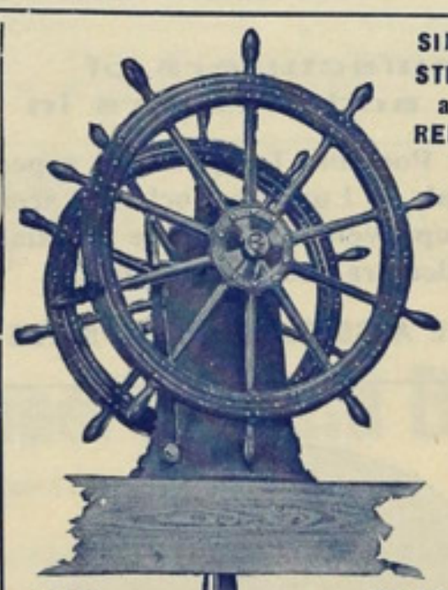

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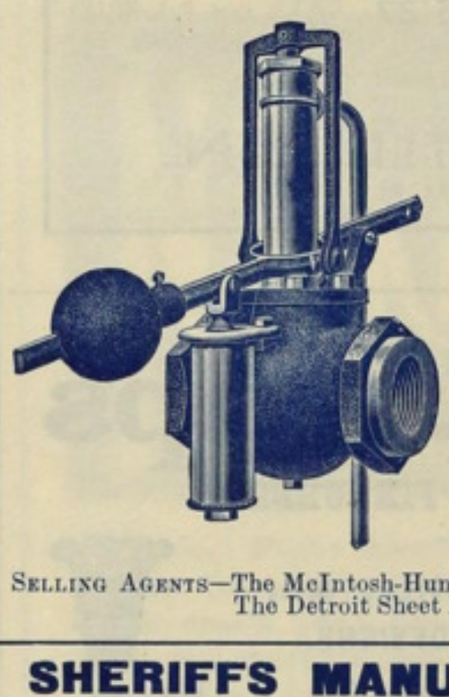

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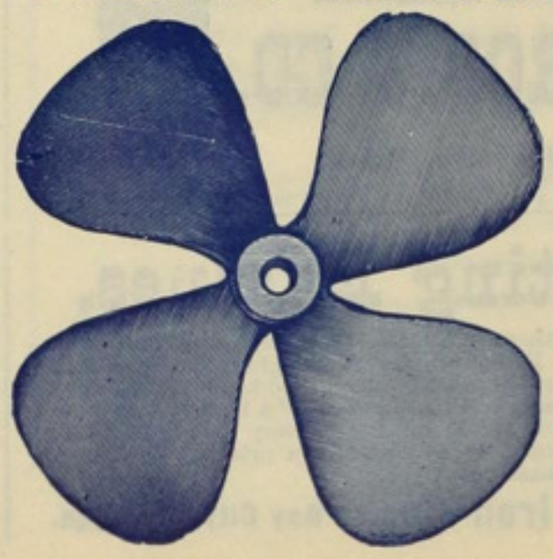

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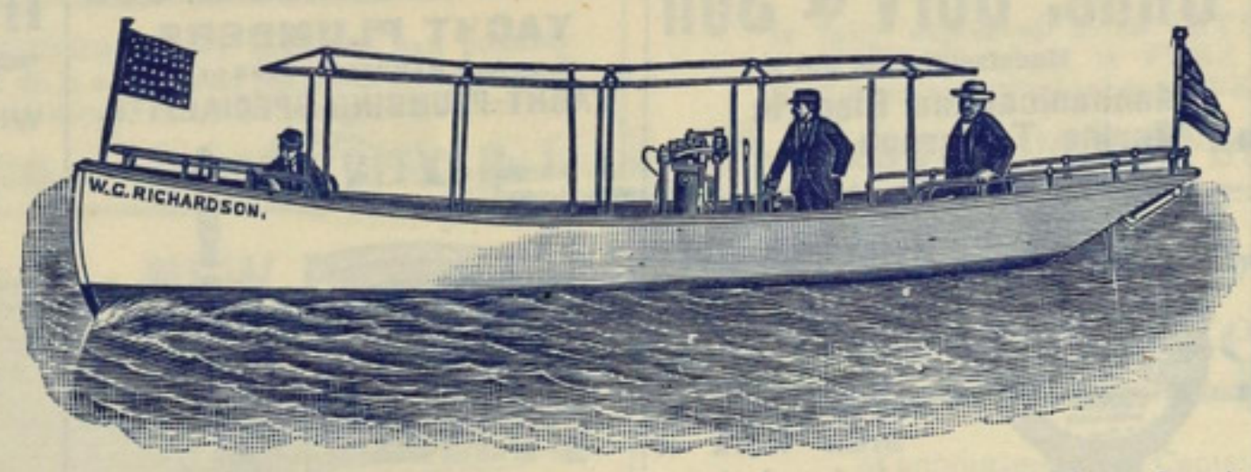

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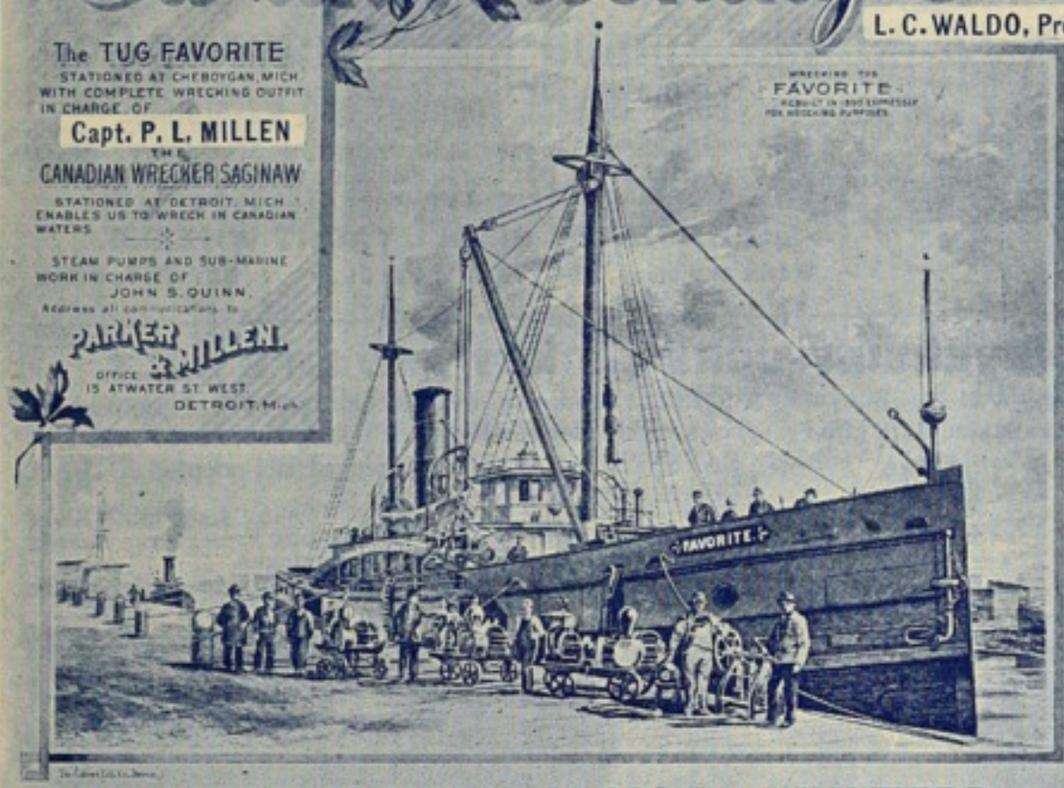

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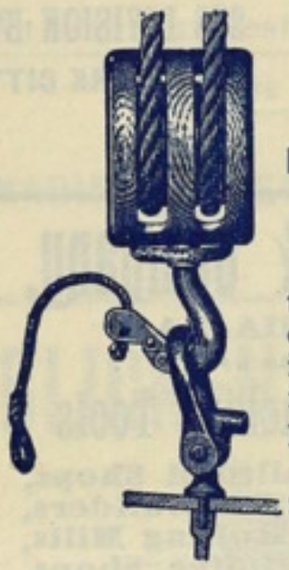

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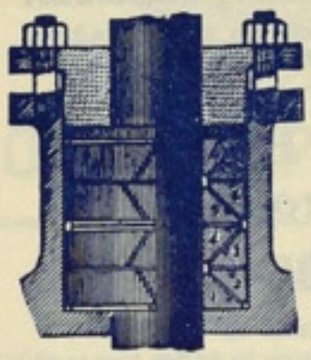

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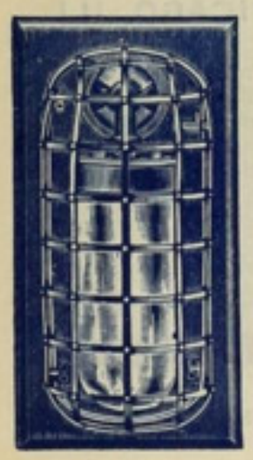

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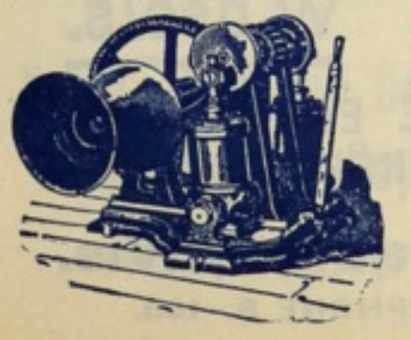

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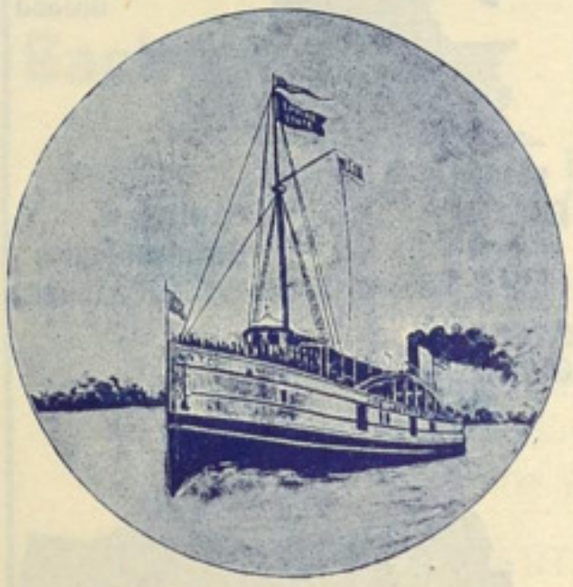

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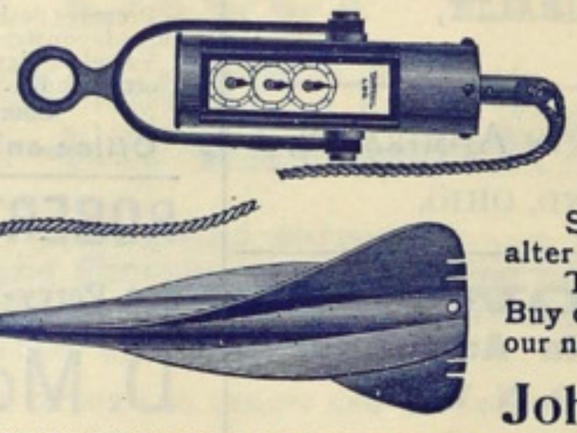

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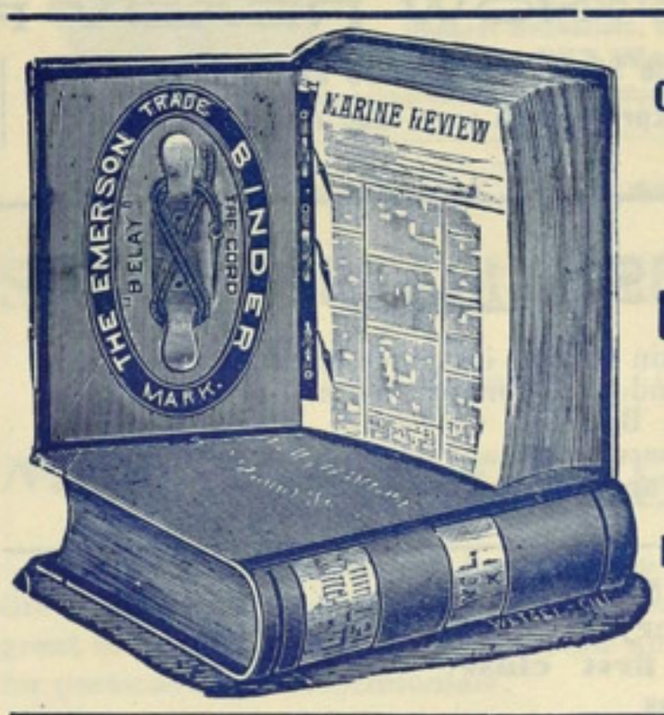

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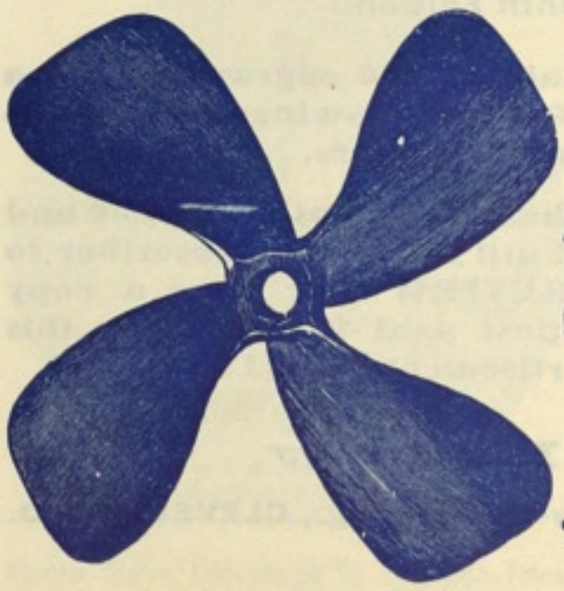

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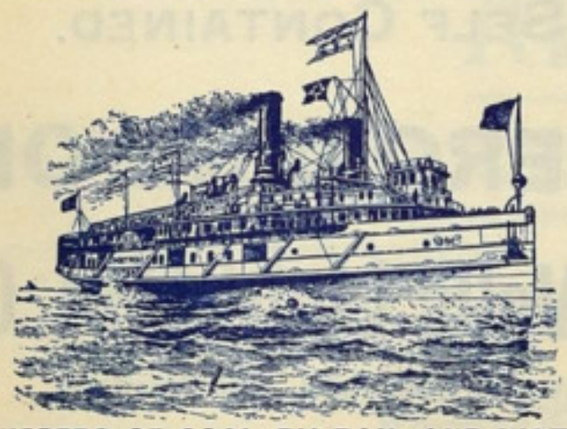

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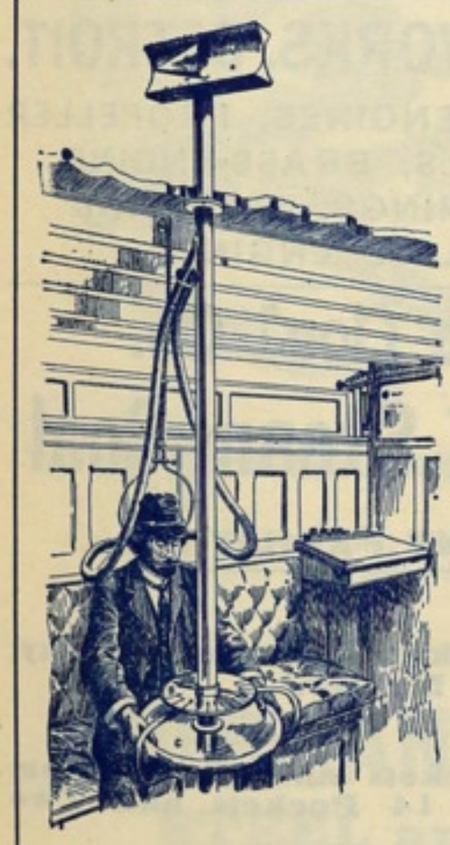

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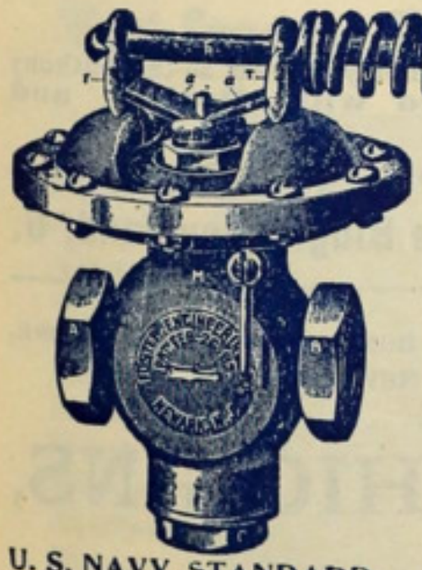

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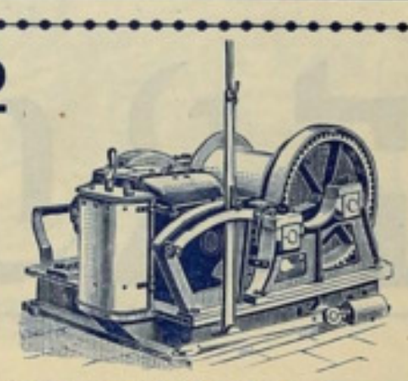

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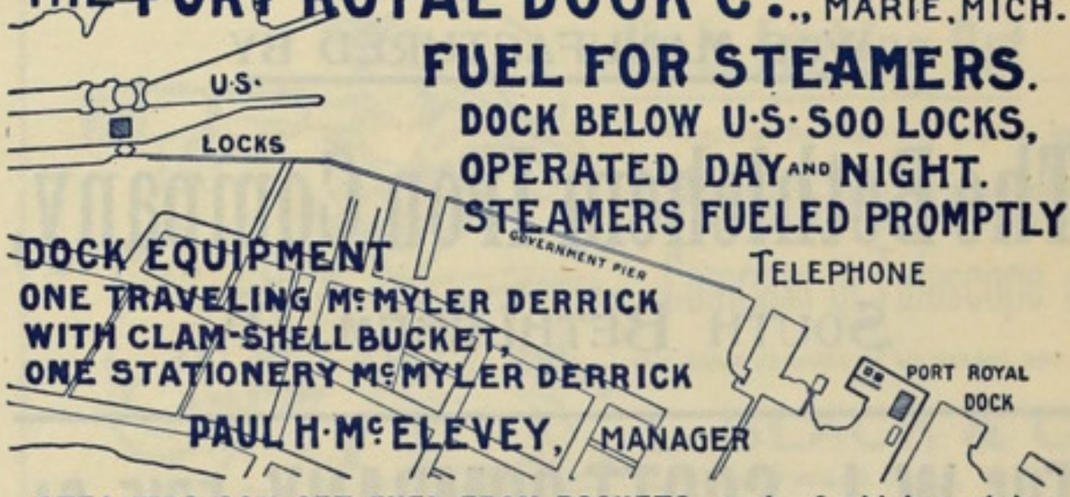

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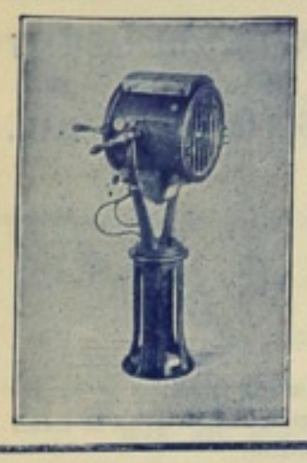

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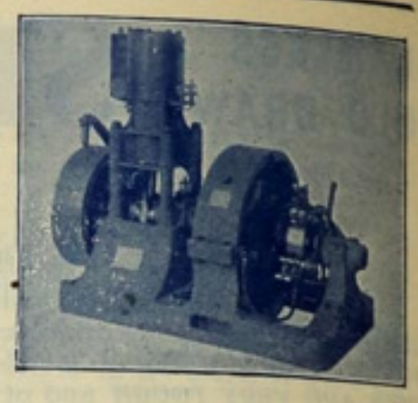

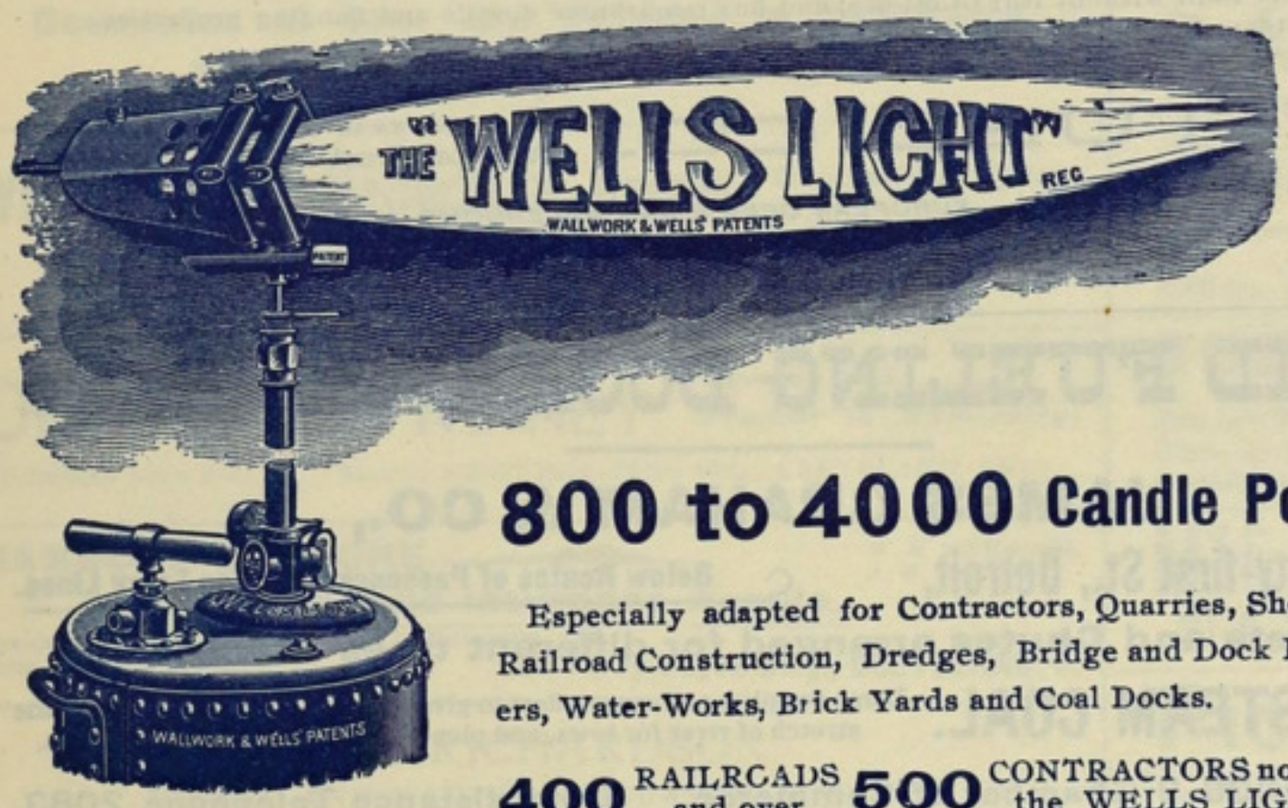

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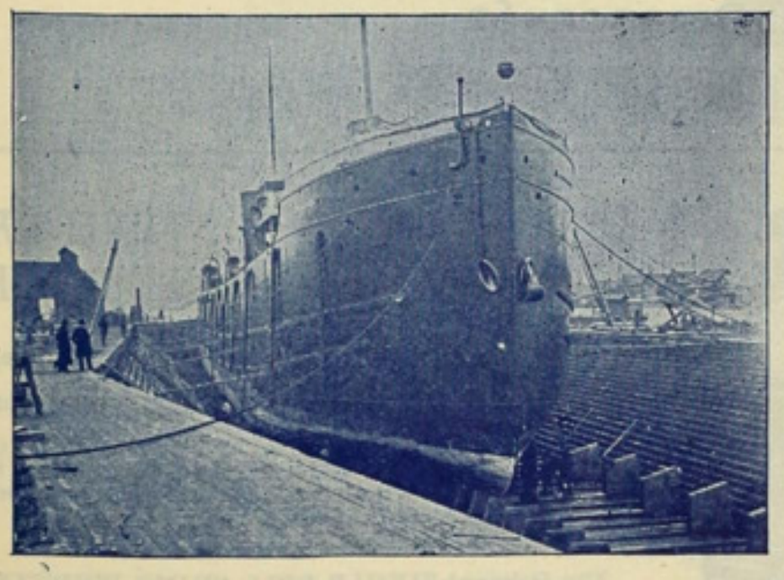

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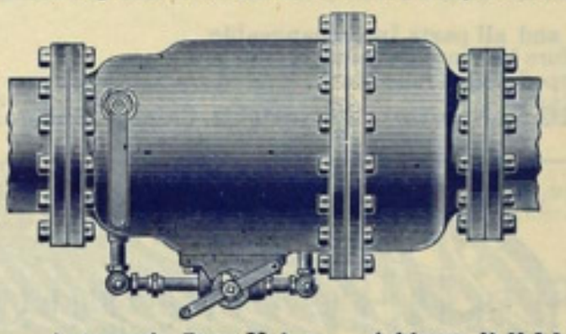

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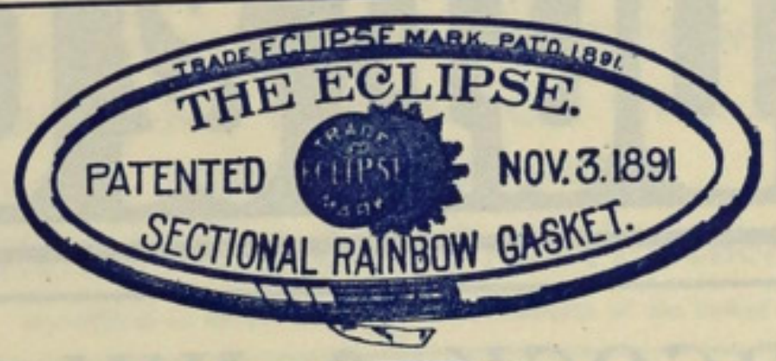

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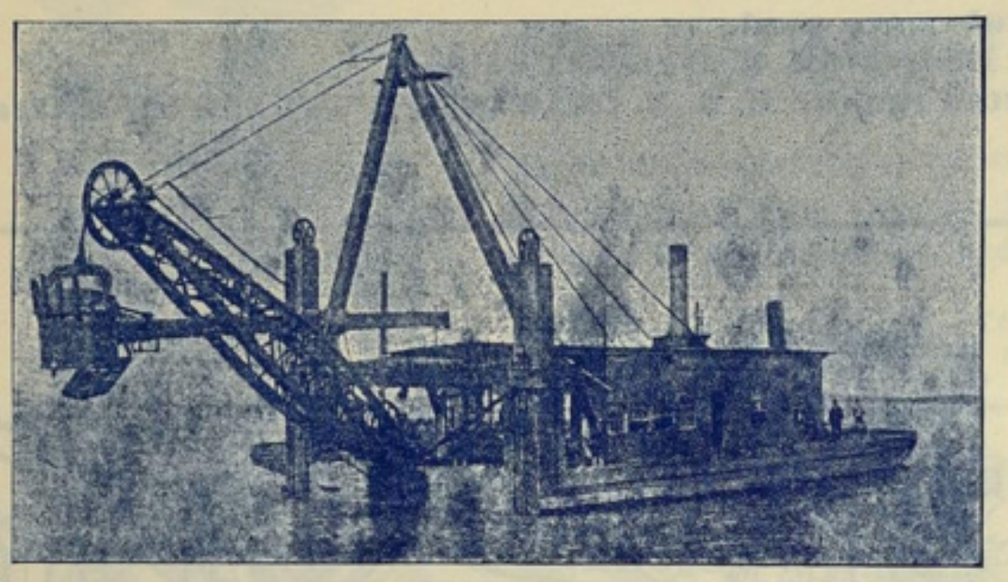

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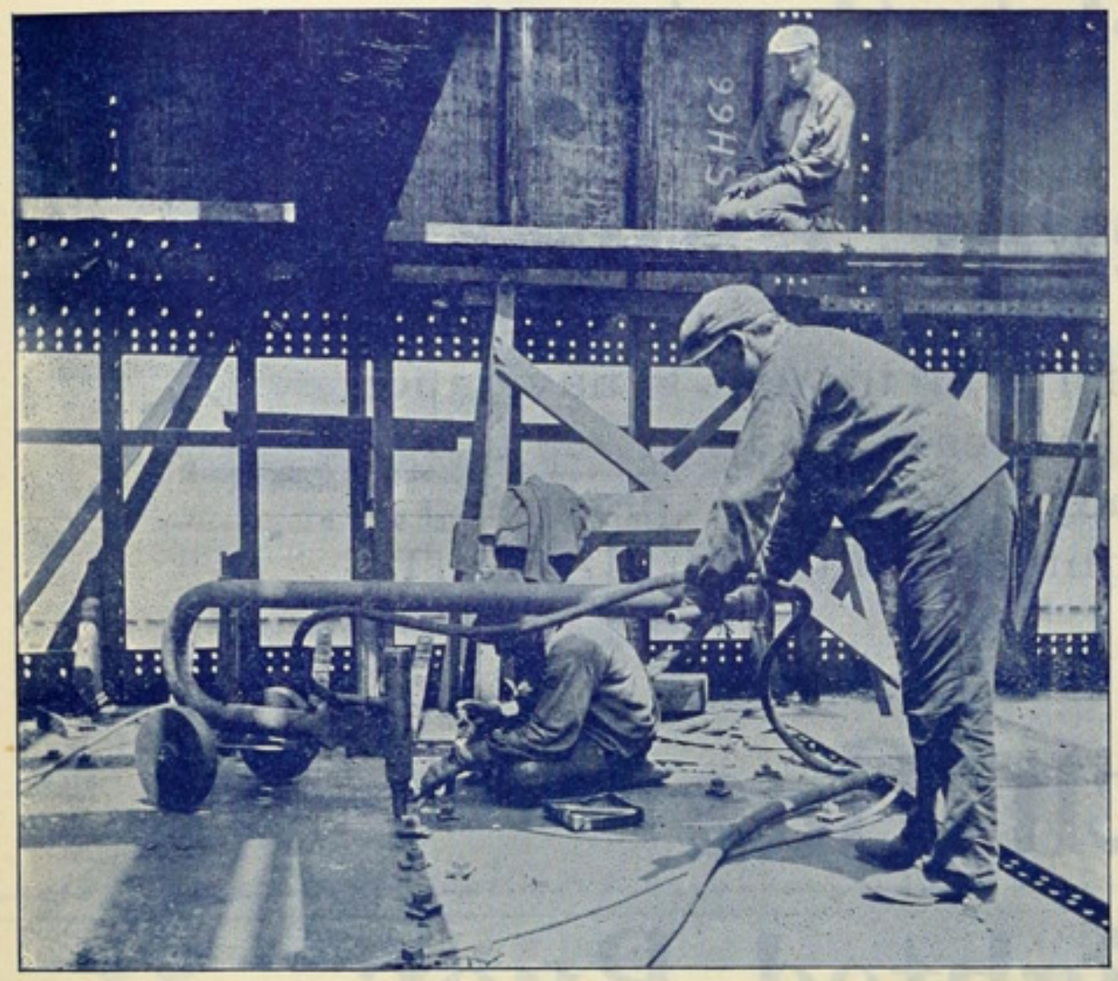

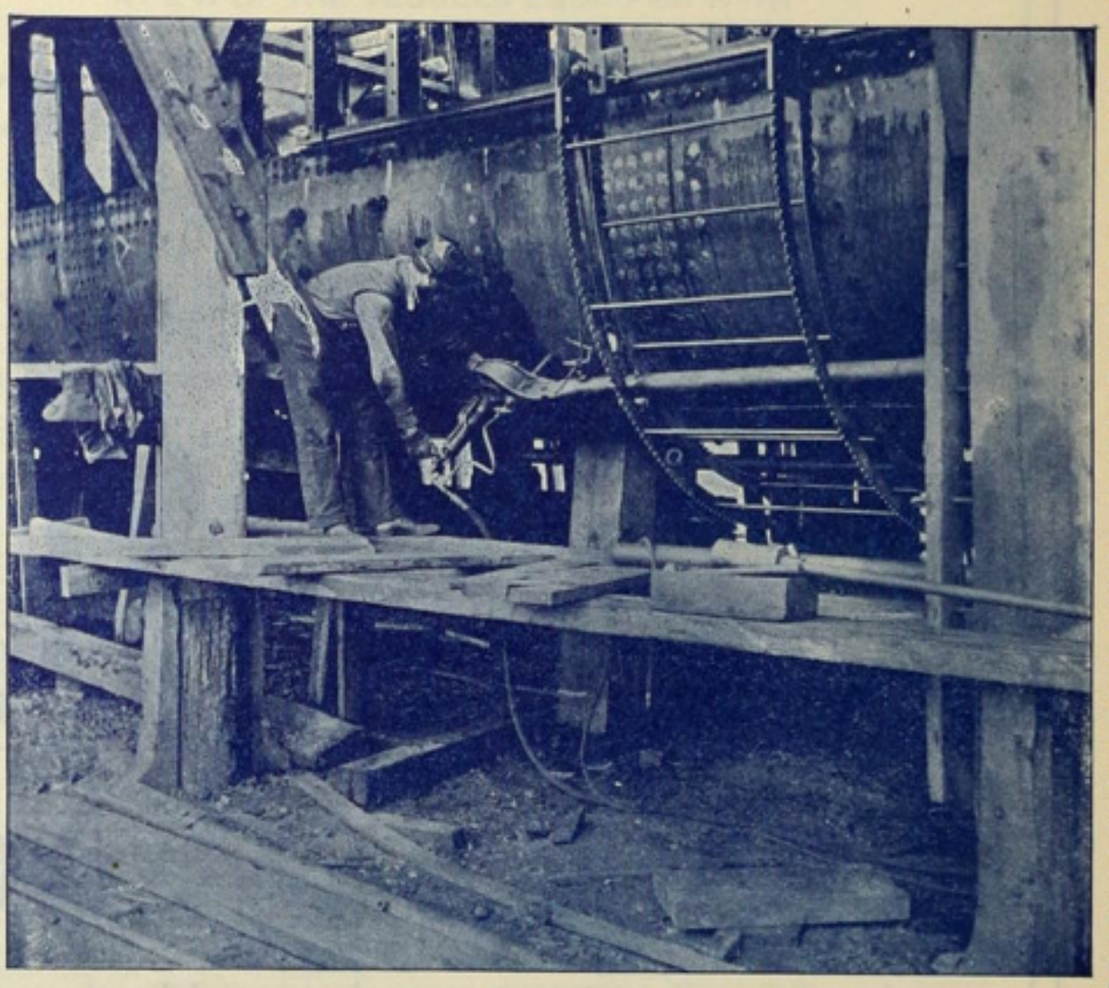

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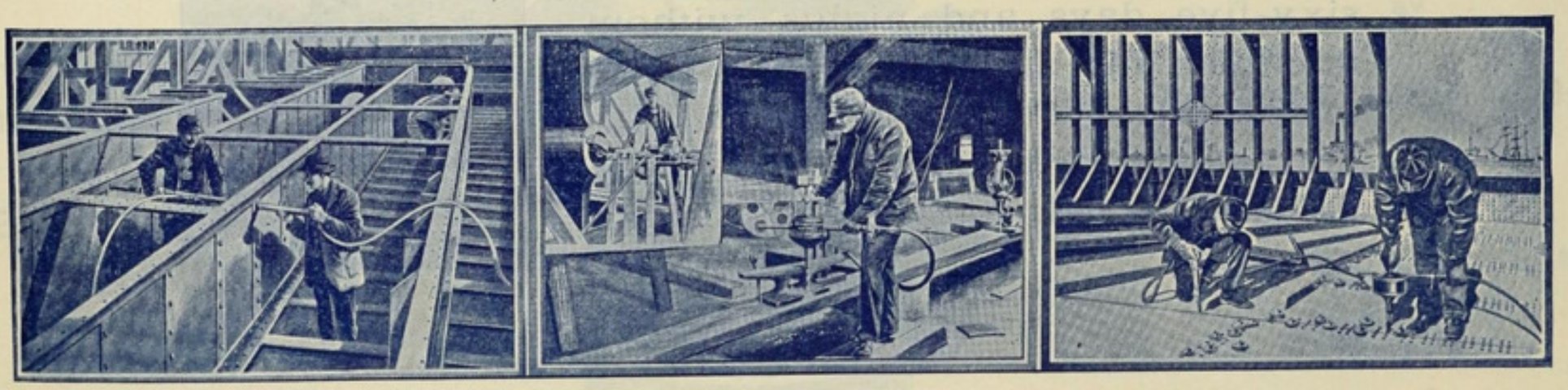

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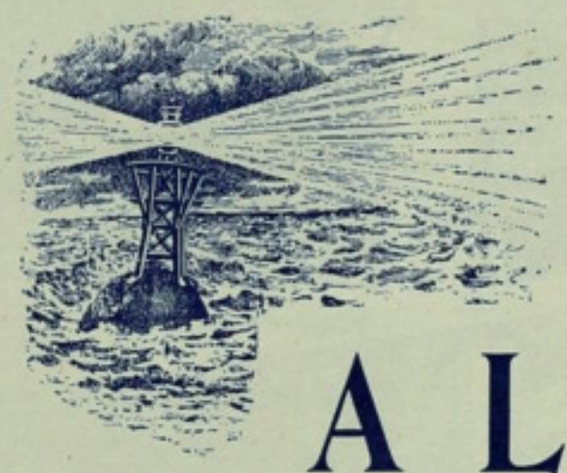

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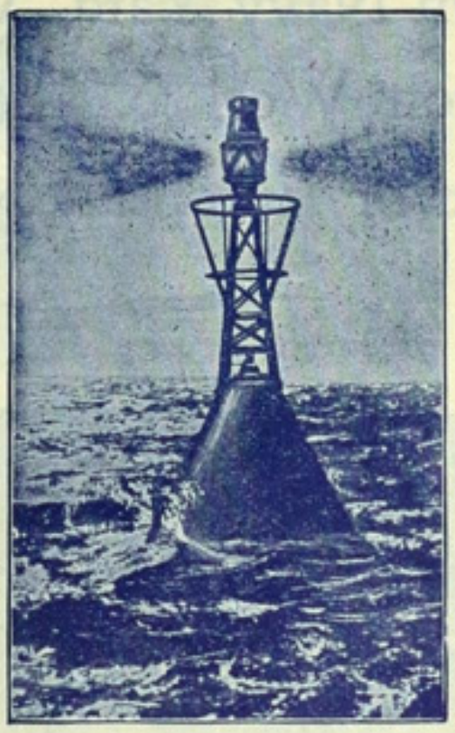

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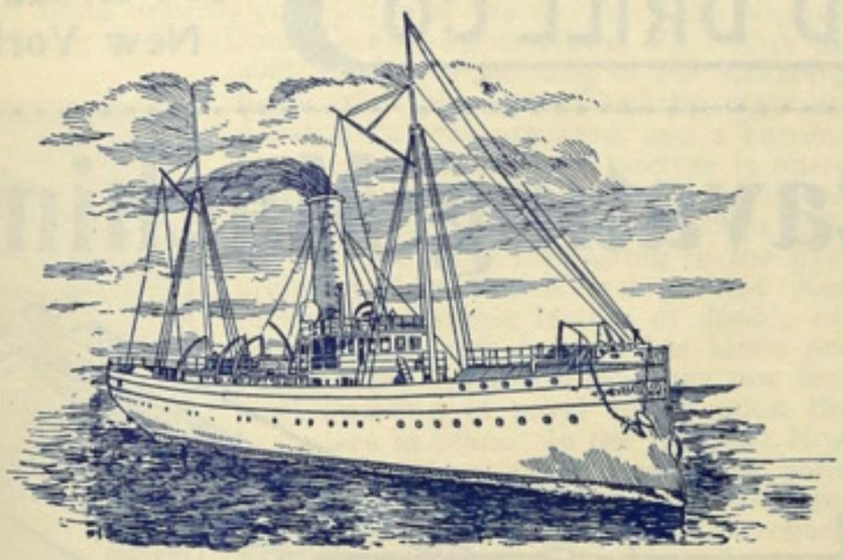

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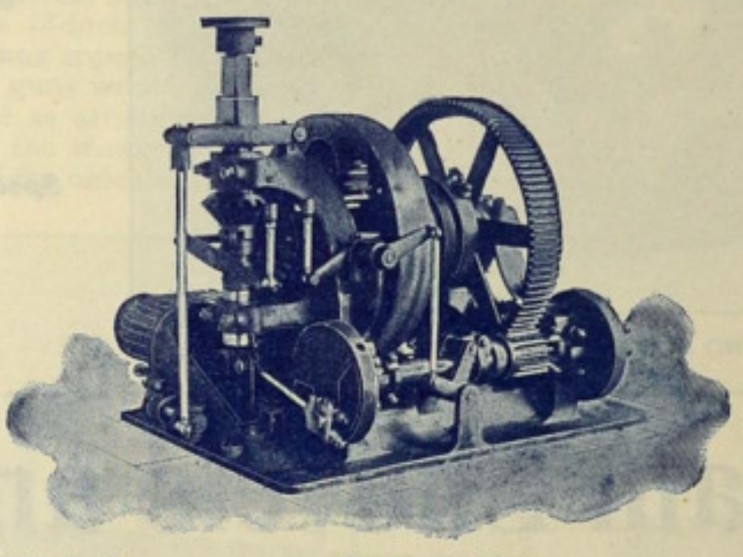

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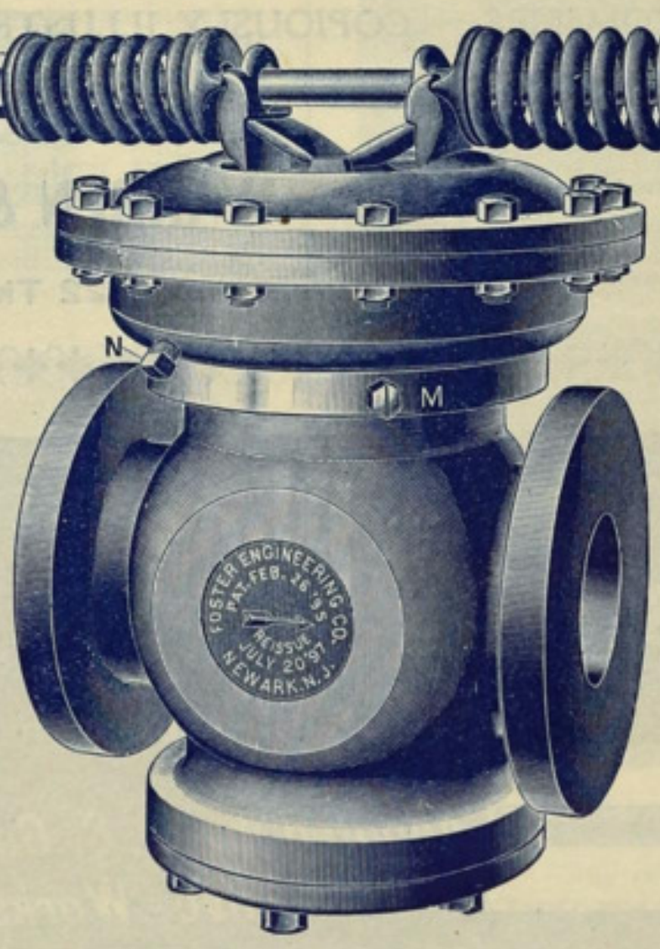

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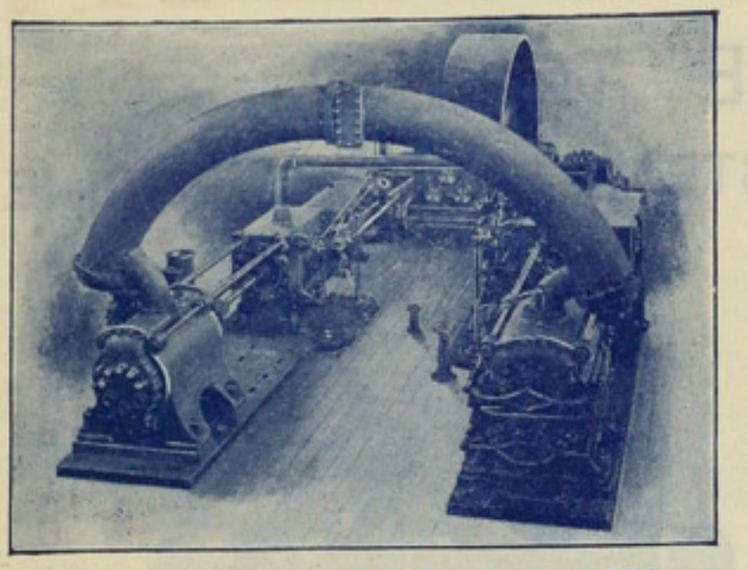

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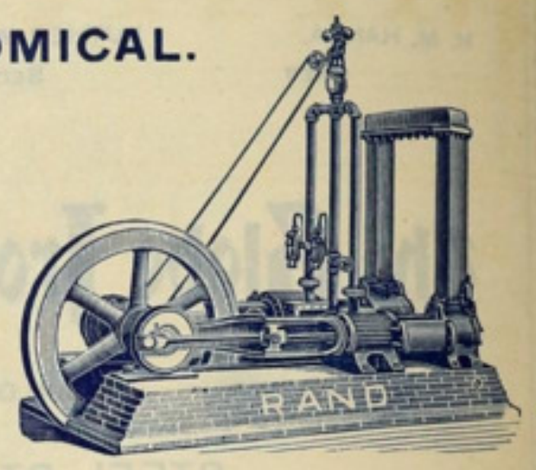

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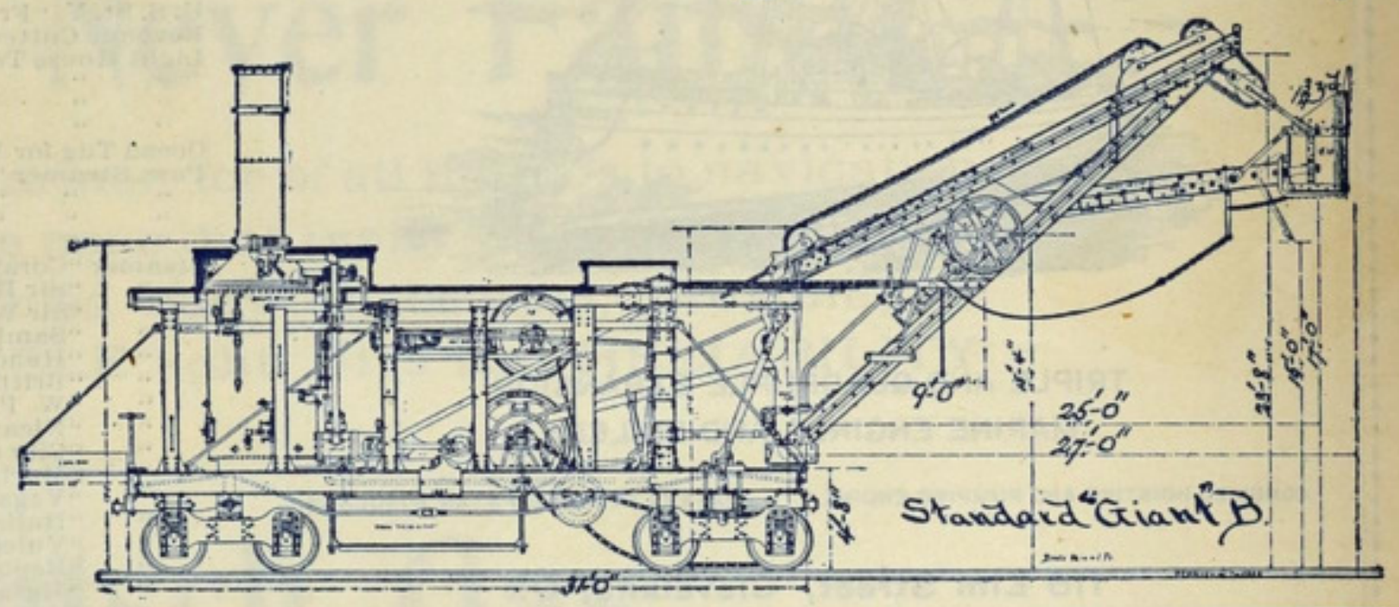

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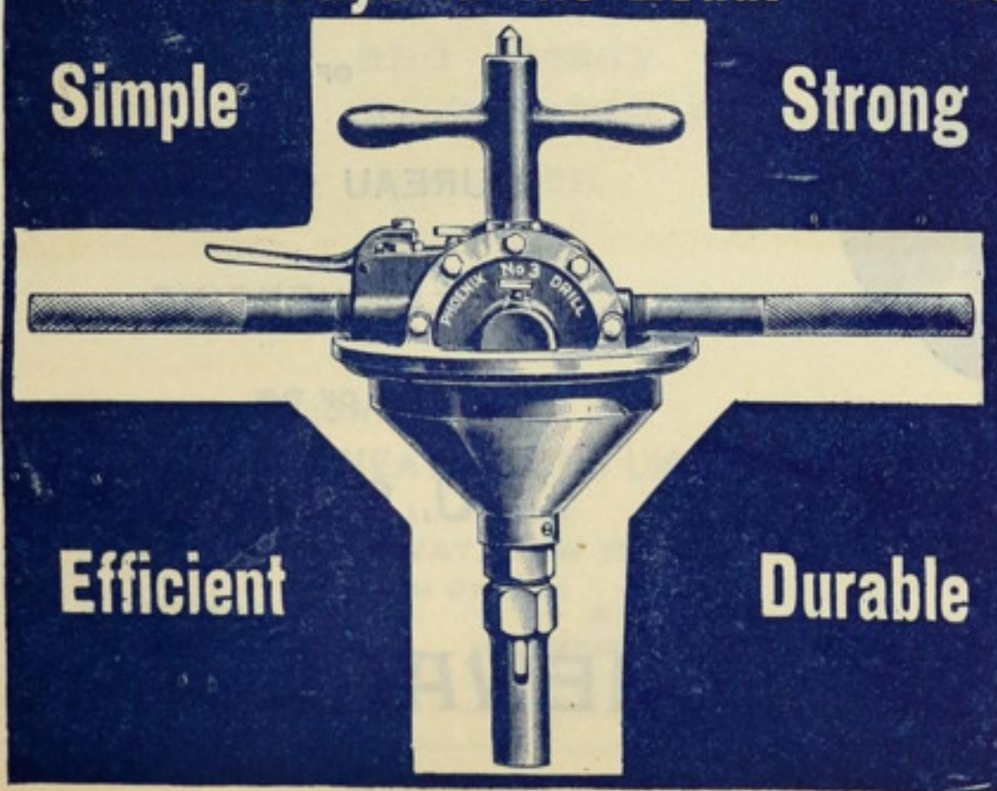

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